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5300 Kc.	7011.75 Kc.	7063 Kc.	7150 Kc.	10.530 Mc.
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EDITORIAL



"THE MOVING FINGER"

"The Moving Finger writes; and, having writ,

Moves on: nor all thy Piety nor Wit
Shall lure it back to cancel half a line,
Nor all thy Tears wash out a Word
of it."

Rubaiyat of Omar Khayyam.

Hardly have the joyous sounds of Christmas faded into silence than mankind hears the bells toll in the New Year. The years of our earth have increased by one and Time has closed the door on another gamut of days. The year has become the past.

Looking back we see our attainments, our defeats; looking forward we see—What? Our future hopes, perhaps fears. And what does the future hold for our—yes OUR—Institute.

Let us consider. One of our great opportunities in the coming year is active participation in the great International scientific undertaking of the Geophysical Year. Here is the vision splendid of co-operation towards a single goal and we—the

Institute—are in the position to be active workers in the field.

And then the Convention. The time when we can air our problems around the table in friendly discussion. This may seem to be the affair of the few, but it is definitely not. The items discussed are those of individual members supported by the Division, finally carried to Federal level.

So much for some of our hopes; what of our fears? We must face Television interference. The problem is small at the moment. Television is in its infancy and Amateurs have prepared for most eventualities, but it must be expected that some difficulties will arise. We must not allow these to defeat us.

We must also face the problems surrounding Civil Defence. It may be necessary to make some sacrifices in order that we can play our part should unforeseen circumstances arise.

Thus enters 1957 and with the beginning of this New Year, WE—the Institute—can confidently look to the future.

FEDERAL EXECUTIVE.

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Design Notes on Transistorised Audio Amplifiers

HANS J. ALBRECHT,* VK3AHH

WHILE more than sufficient literature seems to be available on how to conduct cut-and-try experiments with transistors, it is generally difficult to obtain information on the proper engineering approach in designing transistorised amplifiers. It will therefore be attempted, in this article, to deal with special design aspects encountered with such amplifiers, based on transistor-network analysis and on the experience the author was able to gain in this field during the last few years.

To be useful, this article cannot cover the very fundamental information on transistors, and readers requiring such an introduction are referred to relevant books, booklets, articles, manufacturers' advertisements, etc., too numerous to list. An introduction of higher standard may be found in the two books mentioned as references.^{1,2}

Similar to vacuum-tube technique, it is essential to operate a transistor within its power ratings and, for best results, within the linear portion of its characteristics. An additional requirement is the stabilisation of the amplifier circuitry, to keep the effects of ambient temperature within permissible limits.

Three circuit connections are possible:

- (i) **Common-emitter connection;** useful for amplification; input and output resistances are of the order of 1,000 and 70,000 ohms, respectively; counterpart to grounded-cathode operation.
- (ii) **Common-base connection;** useful for amplification; input and output resistances are of the order of 100 to 500 ohms and 200,000 ohms, respectively; counterpart to grounded-grid operation.
- (iii) **Common-collector connection;** mainly used for matching a high impedance to a low impedance load; input and output resistances are of the order of 100,000 and 2,000 ohms, respectively; counterpart to cathode-follower operation.

For an RC-coupled or direct-coupled cascade amplifier common-emitter or common-base stages or a combination of both may be utilised. The use of a common-collector stage as matching stage between the amplifying stages is feasible, although no advantage can be obtained in practice. In fact, it has been found that a cascade of three common-emitter stages results in more amplification than that of two common-emitter stages isolated and mutually matched by a common-collector stage.

If transformers are used as means of coupling one stage to the other, they must be so designed that an appropriate matching of the output resistance of one stage to the input resistance of the next stage is achieved.

Considering the loss in gain due to the mismatch from stage to stage in an RC-coupled or direct-coupled cascade

amplifier and thus the necessity of an additional stage to compensate for the loss, transformer coupling is advantageous if a minimum number of stages is a main objective. However, it must be pointed out that the use of more than one or two transformers is not advisable in a cascade amplifier because of the obvious tendency towards oscillation, similar to vacuum-tube technique. Furthermore, appropriate mid-gate transformers may be relatively expensive.

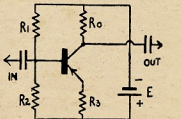
DESIGN CALCULATIONS

As indicated above, the circuit components must be so chosen that the quiescent operating point is within the straight part of the characteristics and that changes in the characteristics, due to variations in the ambient temperature, are automatically compensated.

To achieve this aim, the circuit may be arranged in several ways, to some extent depending on whether one or more separate supply sources are used. For various reasons the single-source circuit results in a simpler circuit, although the actual design may appear to be more complicated.

The figure depicts an amplifier stage in common-emitter connection with appropriate bias stabilisation. Fundamentally, the emitter current (I_e) may be regarded as being split up into collector (I_c) and base (I_b) currents, thus

$$I_e = I_b + I_c \quad \dots \dots (1)$$



Also, the collector current consists of the emitter current multiplied by the current amplification factor (α) plus the collector current at zero emitter current (I_{c0}). " α " is defined by the derivative of the collector current with respect to the emitter current, with the collector voltage kept constant.

We have

$$I_c = \alpha I_e + I_{c0} \quad \dots \dots (2)$$

Referring to the figure and designating the current through R_1 by I_1 , and that through R_2 by I_2 , the base current is given by

$$I_b = I_1 - I_2 \quad \dots \dots (3)$$

And, neglecting the small potential between the emitter and the base,

$$I_1 R_1 = I_2 R_2 = E - I_e R_3 \quad (4)$$

E being the supply voltage.

We can now proceed to discussing the actual design of the stabilising circuit, based on the above formulae. A so-called stability factor has been defined for transistorised amplifier circuits.¹

Mathematically, this factor " S " is the derivative of the collector current with respect to the zero-emitter collector current:

$$S = \frac{dI_c}{dI_{c0}} = \frac{1 + R_0/R_2 + R_0/R_1}{1 - \alpha + R_0/R_2 + R_0/R_1} \quad \dots \dots (5)$$

Particularly the zero-emitter collector current (I_{c0}) is subject to changes with temperature. Fluctuations in I_{c0} appear in the collector current I_c multiplied by S . The value of this factor should be as low as possible for optimum circuit stabilisation. In practice, however, a compromise must be made between economical current consumption and a low value of " S ", which means relatively large current drain. For audio amplifiers a factor $S = 2$ would give very good stabilisation. Nevertheless, one of the greatest advantages of using transistors is their enormously low current consumption and, consequently, the relatively large practical efficiency. This feature should not be jeopardised under any circumstances. The author found, by several designs, that a stability factor of six to nine is still acceptable for audio amplifiers. This value results in very low current consumption at reasonable and sufficient stabilisation.

The next step in designing an RC-coupled audio amplifier stage with single-battery supply is the calculation of each of the resistors R_1 , R_2 , and R_3 . From expressions mentioned above, the following formulae may be derived:

$$R_1 = \frac{E(S - 1)}{I_c - SI_{c0}} \quad \dots \dots (6)$$

$$R_2 = \frac{S - 1}{(1 - S + \alpha S)(I_c - I_{c0}) - I_{c0} - SI_{c0}} \cdot \frac{E}{a(E - V_e - R_3 I_c)} \quad \dots \dots (7)$$

$$R_3 = \frac{a(E - V_e - R_1 I_c)}{I_c - I_{c0}} \quad \dots \dots (8)$$

where

V_e = collector voltage } at operating point
 I_c = collector current }
 R_3 = load resistance }

In a typical stage, a junction triode OC71 is used in common-emitter connection with $R_1 = 47,000$ ohms, $R_2 = 10,000$ ohms, $R_3 = 3,900$ ohms, and $R_0 = 1,000$ ohms, the supply voltage E being 4.5 volts. This is one stage of a fully-transistorised amplifier designed by the author early in 1956 and used as modulation amplifier at his station.

To illustrate the change of components if a different type of junction-triode transistor is utilised, details of another RC-coupled stage of the cascade amplifier just mentioned are given below. This stage contains an OC72 (ratings higher than those of the OC71, and cut-off frequency substantially lower but above the audio range) in common-emitter connection. R_1 is 18,000 ohms, R_2 is 4,700 ohms, R_3 is 1,000 ohms, and R_0 is 470 ohms; E being 4.5 volts.

*10 Belgavia Ave., Box Hill North, Vic.

To arrive at these values design steps can be recommended as follows:

- (i) Select the type of transistor and consult the manufacturer's publication of characteristics for values of β and I_{cs} .
- (ii) Choose the mode of operation, load resistance R_L , and a suitable quiescent operating point from the characteristics published, defined by I and V_c at the operating point.
- (iii) Select a value for the stability factor "S".
- (iv) Substitute "a", "L", " I_{cs} ", " V_c ", " R_L ", and "S" in eqs. (6), (7), and (8) and thus determine values of R_1 , R_2 , and R_3 .

Table 1 shows typical values of the quiescent operating points for two transistors available on the Australian market, namely P-N-P junction triodes OC71 and OC72, both operated in common-emitter connection class A. "a" is 0.98 for both types.

method cannot be recommended for transistor cascades. The main reason is that the input resistance of a transistor stage is so low that it actually governs the load resistance of the preceding stage, and so on. In practice, the load at the final output stage will be found to influence the input resistance of the first stage of the cascade. A far more reasonable approach is the use of matrices, and, as far as the author is concerned, no other method appears to be so well representative of the special features of transistor circuits. It may be added, for readers trained in this field of higher mathematics, that the h-matrix of each stage is best transformed into a cascade matrix which may then be solved for the entire cascade. This yields the overall matrix from which the overall relationships of input to output impedances, etc., can be determined.

The author designed his fully-transistorised modulation amplifier on this basis. The cascade amplifier consists of

The gain of the amplifier is more than sufficient for adequate modulation and appreciable volume reserve. Combined with a transistorised audio oscillator for m.c.w. modulation, the small unit is extremely useful and versatile.

REFERENCES

1. Richard F. Shea, et al, Principles of Transistor Circuits, Wiley (1953).
2. Frederick E. Terman, Electronic and Radio Engineering, McGraw-Hill (1955).

BOOK REVIEW

"HI-FI FROM MICROPHONE TO EAR"

By G. Slot

This is another publication (180 pages of 5½" x 8½") from Philips Technical Library written to meet the needs of music lovers seeking to improve the quality of reproduction from their equipment, by providing a complete survey for the non-technical reader of the technique of sound recording and reproduction.

(Continued on Page 7)

NEW SLANT ON TV AERIALS!!

Armed with the details of element lengths, etc., to construct a TV antenna, Les VK2AOR approached a local shop which sold, among other things, TV antennae, for information on the possibility, or otherwise, of obtaining some duralumin tubing.

The shop assistant enquired the reason for wanting dural tubing and Les, seeing a TV antenna strung from the roof, pointed up and said he wanted to make one of those aerials. Les was informed, most respectfully, that it would be almost impossible for him to successfully build a TV aerial because the elements of such aerials are filled with an electrolyte, a resonant gas, and that is why the ends of all the elements are sealed flat to keep the electrolyte inside. Les staggered speechless from the shop and is now firmly convinced that if the TV antenna he has constructed does not perform as expected it is because it has no resonant gas in the elements.

Typical data for quiescent operating point

	OC71	OC72
—E supply voltage	4.5	4.5 volts
—V _c collector voltage	0.91	1.8 volts
—I _c collector current	0.73	1.82 Ma.
R ₁	3,900	1,000 ohms

Table 1.

Similar to the cathode resistor in vacuum-tube technique, R_3 has to be bypassed by an appropriate capacitance in order to keep the impedance in the emitter circuit at a negligible level for the audio frequencies used. Values of 10 to 200 μ F are practicable. This capacitor, as well as the coupling capacitor which is of the order of 1 to 10 μ F. (because of the generally lower impedances in transistor technique), may be varied according to the frequency compression desired.

The "h"-parameters which are published by manufacturers may be used to obtain approximate data on gain, optimum load impedance, etc. In fact, these "h"-parameters are the elements of the h-matrix of a transistor stage regarded as a four-terminal network. A set of formulae can be derived on that basis but only four of the most useful ones are mentioned here:

For common-base connection:

$$\text{Voltage gain} = \frac{h_{21}}{D + h_{11}/R_e} \dots (9)$$

optimum load impedance =

$$\sqrt{h_{21}/(D + h_{11}/R_e)} \dots (10)$$

For common-emitter connection:

$$\text{voltage gain} = - \frac{h_{21}}{D + h_{11}/R_e} \dots (11)$$

optimum load impedance =

$$\sqrt{h_{21}/(1 + h_{11}/R_e)/(D + h_{11}/R_e)} \dots (12)$$

$$D = h_{11}h_{22} - h_{12}h_{21}$$

The design of cascade transistor amplifiers of several stages is relatively difficult if compared with corresponding calculations in vacuum-tube technique. Whereas stage-by-stage computation is the usual method in the latter case, this

one OC71 stage and two OC72 stages, all RC-coupled and operated in class A. Details of this amplifier and its design are to be published elsewhere. However, some comments on its performance may be of interest.

At an overall current consumption of 3 to 5 Ma. at 4.5 volts, the three-stage amplifier is an economical and reliable unit. A crystal microphone is matched to the amplifier input by a special transistor matching stage (using an OC71, no amplification). The output of the amplifier is transformer-coupled to the grid of a clamp-tube which acts upon the screen-grids of the two 807s used in the final of the transmitter, because transistors available in this country can only be used for low-level applications.

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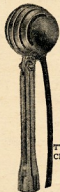


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DIAGNOSIS OF TVI*

A SYSTEM OF LOCATING THE CAUSE OF INTERFERENCE

BY R. H. HAMMANS, G2IG

• This article will not tell you how to cure television interference but it does describe a deductive system of investigation which will help to find the cause of TVI in any particular case. Once that has been done, well-known principles which have been described in these pages many times in the past may be applied.

BEFORE TVI can be cured, an intelligent system of tracing and diagnosis by means of available evidence is highly desirable. In this article it is intended to systematise the complex business of ascertaining the cause rather than to offer means of effecting a cure.

This conception of tracking down interference to its final elimination is based on a series of "go" or "no go" trials, leading, according to the results, down a chain of observations and tests which will provide an answer which should be conclusive. A chart or "tree" is given for rapid reference and to show more clearly than the text the logical sequence of the method.

TYPES OF INTERFERENCE

There are three categories of television interference caused by Amateur transmitters:—

- Harmonic or spurious radiation from the transmitter and/or its aerial system.
- Response by the television receiver to signals outside its design pass-band.
- The generation of harmonics in non-linear elements in the vicinity of the transmitter which re-radiate and enter the receiver in the same manner as if they were radiated from the transmitting aerial.

Cases in category (a) must obviously be treated at the transmitter and the Amateur should not escape responsibility. Those in category (b) can only be cured at the receiver and in general the G.P.O. is sympathetic towards the principle that the Amateur is not to blame. In category (c) neither the transmitting Amateur nor the receiver owner is to blame except in so far that either the Amateur or the receiver owner may have somewhere about his property metalwork which, due to corrosion or other form of bad contact, is producing the trouble. A corroded receiving aerial of course comes into category (c) and the owner has the cure in his own province.

Category (a) Causes which must be dealt with at the Amateur Transmitting Station

The system to be adopted in this case is as follows:—

- Connect the transmitter to a dummy load. Operate the transmitter in all other respects in the same manner as that used when interference is known to be caused.

Possible Results:

- Interference no longer caused.
- No change in interference.
- Appreciable reduction of interference.

If the results are as in (i) then it is clear that all the trouble is brought about by the signal radiated from the transmitting aerial. It may, therefore, be due to harmonic radiation, to receiver defects in category (b) or to effects in category (c).

If the results are as in (ii) there is strong evidence of harmonic radiation from the early or final stages of the transmitter and well-known methods of cure, such as screening, filtering of leads, etc., should be applied. It is unlikely that the receiver is to blame or that non-linear elements are involved since there should be no swamping signal, as would be the case if the transmitting aerial, instead of the dummy, were in use.

If the results are as in (iii) there is every likelihood of a combination of harmonic radiation from the transmitter itself as in (ii) plus further interference falling into categories (a), (b) and (c). The procedure, therefore, is to work on the transmitter screening and filtering, etc., until interference is eliminated on dummy load.

- When all interference on dummy load has been cured, the following test should be carried out. Reconnect the aerial to the transmitter through a low-pass filter of good or known performance.

Possible Results:

- Interference no longer caused.
- No change in interference.
- Appreciable reduction of interference.

If the results are as in (i) this is the end of this particular branch of investigation and the case is closed. However, if the results are as in (ii) there is strong evidence that the transmitter was blameless even without the low-pass filter and that the case falls into either category (b) or category (c) or both.

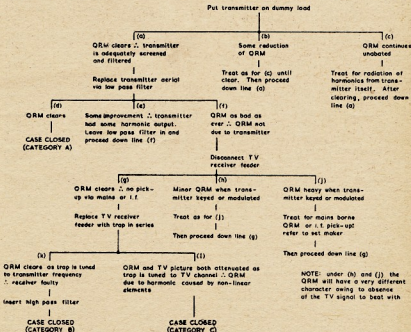
If the results are as in (iii) the transmitting station with the low-pass filter in circuit is probably now blameless and the remaining interference is due to causes in categories (b) or (c) or both. It is, of course, necessary to make sure the low-pass filter is really effective before these assumptions can be true.

At this stage of the investigation the transmitting station and, therefore, category (a) have been eliminated and only categories (b) and (c) remain.

Category (b) Causes which must be dealt with at the Receiving Station

- The system to be adopted in this case is as follows:—

Disconnect the receiver aerial and turn up the brilliance control until the



The chart devised by the author for the rapid diagnosis of television interference.

* Reprinted from R.S.G.B. "Bulletin", June, '36.

raster is just visible. Modulate the transmitter by speech or keying and check whether interference persists.

Possible Results:

- (i) No interference visible.
- (ii) Significant interference still present.

If the results are as in (i) then the interference is coming in via the aerial and the frequency of the interfering signal should be checked. This is best done by means of a tuned trap or traps which will cover the fundamental and appropriate harmonic frequencies of the Amateur signal (see section 4 following). If the results are as in (ii), then at least some interference is entering the receiver via the mains connection or is being picked up on the i.f. wiring in the receiver. Apart from putting r.f. chokes in the mains lead and trying elements of screening around the most vulnerable i.f. circuitry there is not much that can be done by anyone but the set manufacturer.

4.—Reverting to section 3 (i)—the case where on removal of the receiver aerial no trace of interference is to be seen when the transmitter is keyed—the following tests should be carried out.

Insert a parallel tuned circuit, resonant at the transmitter output frequency, in series with the inner conductor of the receiver co-axial feeder. For 14 Mc. the tuned circuit should preferably cover at least a 3:1 frequency band so that at one sweep of the tuning condenser both transmitter fundamental and third harmonic can be rejected. For lower frequency bands the tuned circuit need only resonate at the transmitter output frequency but a second tuned circuit should be available to cover the television band.

With the transmitter keyed or modulated, and the television transmission on the air (preferably with test card C), rotate the trap condenser in the vicinity of the known resonance point for the transmitter frequency as determined with a grid dip meter.

(i) If a substantial reduction in interference is observed, then the trouble is either swamping (cross modulation) or i.f. break-through or image response. Which it is can usually be deduced from a knowledge of the receiver circuit, but it is of academic interest only since the receiver is at fault anyway.

When it is found that a trap resonant at the transmitter output frequency is effective in reducing interference, a properly designed high-pass filter of known performance should be inserted in the receiver feeder. Any remaining interference is probably due to causes in category (c).

(ii) If no appreciable reduction is observed on tuning the trap to the transmitter output frequency, the evidence is that the receiver is not at fault. Retune the trap—or insert a second trap—to the television channel. Clearly, if the trap is operating effectively, it will seriously attenuate the picture. If the interference is due to a transmitter emission (such as a harmonic or spurious signal) or to a category (c) source, then the trap will attenuate the interference to the same extent as the picture. In earlier tests it has already been established that there is no transmitter output in the television band. Therefore, we have the case of a harmonic free transmitter and

a faultless receiver, yet harmonics are being received. From this it may be deduced that the cause is in category (c) and sheer dogged searching or inspired deduction are needed to find it and attempt a cure.

Category (c). Harmonics caused by Non-Linear Elements

The process by which non-linear elements cause harmonic radiation is akin to that on which metal rectifiers and semi-conductor rectifiers rely for their operation. Generally, any substantial lengths or areas of metal which make partial contact with one another will, by virtue of the existence of oxides and other substances due to tarnishing, behave like an aerial system having a detector at the centre or somewhere along its length. The metal will pick up large currents due to the strong r.f. field in the locality of the transmitter and these currents flowing through the rectifier will be of greater magnitude in one half-cycle than in the other. Thus a sine wave containing no harmonics will be converted into a wave of the same frequency but having an unpredictable and sometimes serious harmonic content. The metalwork, by the theory of reciprocity, re-radiates the original signal plus the harmonics it has itself generated.

The commonest causes are rusty joints in domestic plumbing such as gutters, drain pipes, gas pipes and electrical wiring conduit. Indeed, the phenomenon has been called for many years the "drain pipe effect" or "rusty bolt effect"—the latter, particularly in sea-going installations where an earth bolt has rusted, giving rise to the conditions described. More often than not the efficiency of the rectifier in the corroded joint is very poor and the proportion of harmonic re-radiated to the amount of the fundamental re-radiated is very low, but it must be realised that a field strength of many volts per metre at the fundamental is common in the immediate vicinity of the transmitting station, and a re-radiated harmonic field of 1/1,000,000 compared with the fundamental may be sufficient to cause TVI.

Occasionally, however, the nature and condition of a dusty joint may be such as to rectify quite efficiently, with the result that any modulation of the transmitter may become audible at the joint! At the writer's station, for example, a gutter pipe 20 ft. high and having a loose-fitting joint about 5 ft. from the ground was found to be emitting an audible tone when the transmitter was being modulated for test purposes. On disturbing the joint by vigorously shaking the pipe, the sound output vanished, but there was still a varying degree of harmonic radiation (as detected on a harmonic indicator) as the pipe was moved about.

Some of the most obscure causes, which are at the same time most difficult to cure, are rusty conduit pipes embedded in the plaster of walls. The only hope of tracing these is by means of a sensitive harmonic indicator, preferably in the form of a portable two r.f. stage battery-operated receiver working at the harmonic frequency and having a tuned loop aerial. The transmitter should be modulated and operated at full power while the portable receiver is taken around the neighbourhood exploring for

the points of origin and maximum harmonic indication. The tuned loop aerial will be found quite directional enough to pin-point even hidden conductors in walls and under floors.

After the source has been located it may be an altogether more difficult problem to eliminate the generation of harmonics. In the writer's house there are probably a dozen different instances of this effect, all of which are embedded in the plaster or underneath tongued-and-grooved flooring boards. One of the most disheartening things about this particular trouble is that houses immediately either side may also contain rusty connections which in most cases cannot be dealt with.

FURTHER AIDS TO DIAGNOSIS

One of the commonest forms of TVI is the diagonal "cross hatch" pattern formed on the picture. By observing and measuring the horizontal spacing of the light and dark bars it is possible to deduce the interfering frequency. For example, suppose the horizontal pitch of the pattern so formed is 0.25 in. on a screen 10 in. wide; then there will obviously be 40 complete cycles of the interference "beat" (or heterodyne) occurring in the 80 microsecond of active line duration of the television picture. If 40 cycles take 80 microseconds, then 1 cycle takes 2 microseconds and the frequency is 0.5 Mc. Similarly, a heterodyne of 2 Mc. would be represented by a horizontal pitch of one-quarter of 0.25 in., i.e., 1/16 in.

If the transmitter is on a frequency of, say, 14.333 Mc., its third harmonic will be exactly 43 Mc., and this harmonic will be seen with the vision carrier of the London B.B.C. station on 45 Mc. to produce a heterodyne of 2 Mc. Thus, if the interference is due to the third harmonic, a 1/16 in. horizontal pitch pattern will be produced on a 10 in. wide screen (or, of course, 3/32 in. on a 15 in. screen).

Changing the transmitter frequency to exactly 14 Mc. will produce a 3 Mc. heterodyne and the pitch should reduce in width to two-thirds of the previous measurement.

The pattern will not usually be stationary because the television waveform is locked to the a.c. mains, which are not highly stable in r.f. terms. However, a quick inspection along one line of the raster will enable a fairly accurate measurement to be made even if the pattern is moving quite rapidly. Any pattern having a pitch detectable larger than 1/16 in. on a 10 in. wide picture (in the case of 14 Mc. and Channel 1 for example) is indicative of a lower frequency heterodyne than 2 Mc. Such should be impossible if the trouble is really third harmonic since the transmitter would have to operate outside the high frequency end of the 14 Mc. band to produce any heterodyne appreciably lower than 2 Mc.

On the other hand, if the trouble is due to i.f. break-through or image response in the receiver, heterodynes of this order can be caused. Furthermore, due to "inversion" produced by the mixing process in the receiver, it is possible to increase the pattern pitch instead of reducing it when the transmitter is changed from 14.333 Mc. to 14 Mc.

Details of a Simple Mobile Whip for 40-80 Mx

BY FRANK W. FOWLER,* VK2APF

THIS simple whip has been devised for operation on 40 and 80 metres, for v.f.o. controlled pi output transmitters. It is not proposed to go into full technical details of the operation of the whip, but a few comments may be in order.

The writer has spent many hours trying to evolve something simple that, at the same time, will give reasonably good results on two bands. Let it be stressed that this whip is not the acme of perfection, but it works and is the answer for v.f.o. operation.

It was found that high Q coils are most desirable on a mobile whip. However, this is very nice for the xtal controlled operator who does not want to race up and down the bands, but for the chap who desires to QSY, he must either have a series of coils, and a set of xtals designed for operation in their respective pairs, or make provision to tune the whip.

There are many and varied ways of tuning a whip, but the simplest and most effective way is to use a slider to short out the end of the inductance not required. This is the method used.

In order to induce a greater flow of current in the lower section of the whip, it becomes necessary to load the top of the whip with some extra capacity. This can take the form of a hat, or extra length. The writer settled for extra length because of the increased gain in received signals, and to get away from fancy faldals.

The loading coil used is a fairly low Q coil, the reason being that as we are v.f.o. controlled, we can take advantage of its broadband characteristics and not have to have capacity tuning, as well as inductive tuning, to get right on the nose, which is essential with high Q coils.

The coil former consists of 14 inch plastic water pipe, 8 inches long. This water pipe has good r.f. property and is very solid. It can be worked by heating to 212°F. in water and then will bend.

To take both ends of the whip, a couple of plastic screwdriver handles were turned down to fit into each end of the piping, and hammered in. Yes, you can hammer them in and the pipe will not split.

One hundred and twenty turns of 18 gauge B. & S. enamel wire was then wound on very tightly, being anchored to a one-eighth screw threaded into the pipe at each end. This screw was made to go right into the whip itself so that it would serve as a contactor for the ends of the coil.

Next a slider was fitted to the coil and a piece of phosphor bronze used as the actual sliding contactor, the slider rail being made from a piece of 8 gauge hard-drawn copper wire which was bent and screwed to each end of the coil-insulated from the top end of the winding and connected to the bottom end.

A flat file was then brought into use to make a clean surface for the slider

to slide on, then the whole coil was treated with clear lacquer.

Next a small coil consisting of 12 turns of 14 gauge B. & S. was wound on 14 inch diameter former and tapped at the seventh turn from the start.

The function of this coil is to act as an impedance matching transformer at the base of the whip. This coil is mounted right at the base of the whip and connected from the whip to ground. The feedline used is 10 feet of 50 ohm co-ax, the braid being earthed and the inner conductor for 40 metres is clipped to the tapping; for 80 metres, the inner conductor is connected to the top of the matching coil.

The loading coil is inserted at the junction of the first four feet section and the top eight feet. The reason for the eight feet on top has been explained earlier (extra capacity).

The whip in use at this station is one of the disposal types and was inserted in the plastic screwdriver handles by heating over a gas flame and then screwing in; on cooling down, the whip can be then screwed in and out as desired.

To tune the whip, connect the receiver to it and move the slider up and down the coil until a rise in receiver noise is heard, then tune in a station near the frequency that you desire to work on and again adjust the slider—one turn at a time—until the station is at its strongest level on the S meter. This adjustment is critical, as one turn will mean the difference of being able to load efficiently or not.

RECEIVER NOISE IMPROVEMENT

BY D. G. HAWTHORNE,* VK3ZCD

An article recently published ("New Bottles for Old," "A.R." Sept., '56) prompted the writer to try to improve the noise figure of some of the station receivers.

Sharp cut-off pentodes like the 6AG5 and the 6CB6 had previously been tried, but although there was an improvement in the noise level, trouble was experienced with intermodulation and overloading by strong local signals, particularly in the commercial bands.

Recently, a remote cut-off pentode, the 6BY7 or EF85, has become available locally. It has a novel base, transconductance of 6 Ma./V. (a noise figure better than that of the 6AG5) and a cut-off voltage of about -35 volts. Extensive internal shielding and a very low grid-plate capacitance, make it stable when used in conventional circuits.

The tube was tried in the writer's CR100: the cathode bias resistor of 150 ohms being connected to ground as the gain falls off rapidly with increasing

The whip will now accept power from the transmitter and it will be possible to QSY 10 Kc. either side of the frequency without any appreciable loss of radiation.

The above method of tuning was found to be the simplest and the most effective, not entailing any frequency meters, etc., and it is advised that it be adhered to.

In passing, ZLs have been worked on this whip from Tamworth on 40 and 80 metres, signals being R5 and S7-8 on 40 metres and as high as R5 S9 on 80 metres; and if you all know the ZL boys, you should know that they are not in the habit of handing out S9 reports indiscriminately.

The power used at this station is 4 watts on 40 metres and 8 watts on 80 metres. The reason for the smaller input on 40 will probably be told some other time.

BOOK REVIEW

(Continued from Page 3)

There are chapters devoted to recording and record manufacture, pick-ups, record players, tape recorders, amplifiers, speakers, etc. The section covering room acoustics is especially interesting.

Once you start reading this book, you will find difficulty putting it down, until you have read it right through.

"Hi-Fi from Microphone to Ear" is available from Phillips Electrical Industries Pty. Ltd., 69-73 Clarence St., Sydney. Price £12/1/-.

bias. The Marconi has a 100 volt screen line, but better results were obtained by using series supply from the B+ line via a 68,000 ohm resistor. No additional by-passing was required.

The a.v.c. does not operate until the signals reach a level where noise is no longer a problem, and so it was used (and needed) to prevent overloading of the second r.f. amplifier. Detuning the aerial circuit, as used by VK3AKZ, was not used, there being an increased probability of image response on the higher frequencies.

For receivers other than the Marconi CR series, use of a.v.c. with the 6BY7 depends on the design. The tube was tried in a receiver similar in design to the AR7, best results being obtained when the voltage was obtained from the junction of two 2.2 megohm resistors connected in series between the a.v.c. line and ground.

The improvement in the signal-to-noise ratio was similar to that obtained with a 6AG5, but with virtually no intermodulation with transmitters on adjacent channels.

* 4 Thompson Crescent, Tamworth, N.S.W.

* Flat 3, 11 Leopold Street, South Yarra, Vic.

AMATEUR CALL SIGNS

FOR MONTH OF OCTOBER, 1956

NEW CALL SIGNS

VK— New South Wales
 2APG/P—F. W. Fowler, 4 Thompson Cres.,
 Tamworth.
 2AWW—G. D. Wheaton, 361 Armidale Rd.,
 Tamworth.
 2AYW—J. B. Williams, Sattler St., Bega.
 2AZM—J. D. Mollie, "Berings," New Line Rd.,
 West Pennant Hills.
 2ZDC—G. L. P. Collie, Boyce Ave., Wyong.
 2ZDJ—C. J. Fries, 154 Avoca St., Randwick.
 2ZDS—W. N. Sagers, 12 Henrietta St., Waverley.

Victoria

3ACG—C. F. Green, 20 Paloma St., South Oak-
 leigh.
 3AEM—H. E. Mitchell, 1 Thompson St., Hamil-
 ton.
 3ZDW—F. R. Williams, 62 Wattle Valley Rd.,
 Cumberland.
 3ZEB—S. J. Beaton, 101 McKinnon Rd., Mc-
 Kinnon.

Queensland

4ZAM—K. N. Long, 12 Rillatt St., Wavell Heights,
 Brisbane.

South Australia

5EU—H. S. Young, 18 Chisholm Ave., Burnside.
 5ML—A. M. Tonkin, 63 Lefevre Ter., North
 Adelaide.
 5QL—J. L. Weatherley, 70 Willison Rd., Eliza-
 beth South.
 5ZBM—R. McGregor, 44 Albert St., Prospect.
 5ZBP—C. R. Poole, 38 Norma St., Torrens-
 ville.
 5ZCK—R. J. Krieg, 81 Angle Vale Rd., Gawler
 Rail.
 5ZCM—G. J. Multhead, 14 Adelaide St., Magill.
 5ZCW—E. Westernman, 15 Central Ave., Clear-
 view.

Western Australia

6SS—S. E. Slade (Dr.), 11 Colin St., West Perth.
 6ZAW—P. Salinger, C/o. 6AM, Northam.
 6ZBA—J. R. Bartlett, 28 Windsor St., East
 Perth.

Tasmania

7ZAA—R. K. Wilson, 11 Cunningham St., Burnie.

Territories

6DC—D. R. L. Callow, Mawson Antarctica.
 6DJ—D. H. Johns, Mawson Antarctica.
 6JP—J. D. Pinn, Mawson Antarctica.
 8AT—E. J. Roberts, No. 2 Donga 2nd St. Lae,
 N.G.

CHANGES OF ADDRESS

VK— New South Wales
 2IS—S. G. McLean, 16 Plunkett St., Drum-
 moyne.
 2NP—C. F. L. Bryar, 103 Tennyson Rd., Glades-
 ville.
 2RI—R. M. Tutton, 25 Fourth Ave., Eastwood.
 2TY—R. W. Best, 54 Gladesville Rd., Hunters
 Hill.
 2VD—C. M. Barnett, "Sunny Haven," East Pde.,
 Buxton.
 2ZS—W. J. Smith, Princes Highway, Boma-
 derry.
 2ABW—E. G. Baker, 6 King St., Eastlakes.
 2ALU—L. E. Patison, 1 Campbell St., Wollon-
 gon.
 2AYA—G. A. Ahlstrom, 24 Melville St., Strath-
 field.

Victoria

3CZ—A. I. Berry, 6 Lenden Place, Toorak.
 3RA—C. Greig, 10 Newington Gr., North
 Caulfield.
 3UG—F. N. Culliver, 18 Swanson St., Queens-
 cliff.
 3ZU—F. A. O'Donnell, 89 Sharpe St., Yarra-
 wrong.
 3ADP—D. C. Paice, Lot 24 Allister St., Mt.
 Waverley.
 3ADJ—D. J. Harkin, 25 Williams Rd., Briar Hill.
 3AXX—N. E. Turnbull, Station: 24 Bethall Ave.,
 Parkdale.
 3ZAT—D. D. Tanner, C/o. J. Watkins, Howship
 Ave., Ringwood East.
 3ZDG—I. MacMillan, Station: 159 Dawson St.,
 West Brunswick.

Queensland

4HF—C. H. Foley, Ionospheric Prediction Ser-
 vice, Black Weir, Townsville.

Western Australia

6GU—F. H. Harlock, 61 Sixton St., Inglewood.
 6JC—B. J. Coles, Flat 3, 200 Adelaide Ter., Perth.
 6ZAZ—C. G. Andrews, C/o. Broadcasting Sta-
 tion 6WA, Wagin.

Tasmania

7AL—T. A. Allen, Karoola Rd., Lindisfarne.

CANCELLED CALL SIGNS

VK— New South Wales
 2ST—E. C. R. Stoney.
 2AUO—A. E. C. Cooper.
 2AWE—R. M. Weston. Now VK2AYK.
 2ZAW—G. D. Wheaton. Now VK2AWW.
Victoria
 3QF—F. Rowley.
 3WK—F. W. Soumprou.
 3ADO—D. Clarke.
 3ARC—R.A.A.F. College Radio Club.
 3AZC—J. Cumington.
 3ZBB—A. J. Bowman.

Queensland

4EW—E. H. White.

South Australia

5FY—R. A. Catmur.

Tasmania

7DJ—D. H. Johns. Now VK6DJ.
 7HY—H. M. Yeates.

Territories

1DC—D. R. L. Callow. Now VK6DC.

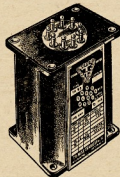
PERMITS GRANTED FOR TELEVISION EXPERIMENTS

VK— Victoria
 3EC/T—E. B. Cook.
 3JT/T—J. J. Carlyle.
 3NR/T—N. G. Roberts.
 3ARS/T—R. C. Stephens.
 3ZAG/T—I. W. Herbert.

Western Australia

6EC/T—E. E. Cornelius.

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 Adelaide.

WEST. AUST.

R. D. Benjamin,
 30 James Street,
 Perth.

THE TWENTIETH B.E.R.U. CONTEST

SIMPLIFIED SCORING AND LOGS

The main feature of the Twentieth B.E.R.U. Contest, to be held on January 26-27, 1957, is the introduction of a new system of scoring, making for simplified entries, and the replacement of scoring zones by a straight bonus for each new Empire area worked.

The old sliding scale of points, which began in the 'thirties, had many merits, but in recent years the percentage of logs received compared with the total number of participants has dropped sharply; it is believed that many Amateurs have been discouraged from making an entry by the complications of the old analysis sheet and the intricacies of "balancing the books." The new system eliminates these difficulties, and thus brings B.E.R.U. into line with most other R.S.G.B. events but, at the same time, retains the unique nature of this historic contest, considered by many Amateurs as undoubtedly the "highlight" of the DX season.

With the 1957 promise of high maximum usable frequencies and the likelihood of excellent DX conditions, the high frequency bands of 14, 21 and 28 Mc. should offer opportunities unequalled for many years (ionospheric storms permitting), particularly for Amateurs with restricted space for aerials and masts of limited height.

The Contests Committee is endeavouring to secure the maximum amount of overseas publicity for the 1957 event, but solicits the assistance of all members in bringing the dates and revised rules to the notice of stations throughout the Commonwealth. More than 400 stations participated in the 1956 event, but we hope to see a great increase in 1957. Remember B.E.R.U. offers the chance of completing your score of Empire prefixes for ED.X.C., B.E.T.A. or W.B.E. . . make sure you are ready on all bands . . . and afterwards please submit an entry or check log.

RULES

1. The contest is divided into two sections, namely: (a) Senior—maximum licensed power; (b) Junior—maximum input 25 watts.

2. The contest (both sections) will start at 0001 G.M.T. on Saturday, January 26, and end at 2359 G.M.T. on Sunday, January 27, 1957.

3. The contest is open to all fully-paid-up members of the R.S.G.B. within the United Kingdom; to all British subjects outside the U.K. but within the British Empire and British Mandated Territories; and to members of British Forces of Occupation operating properly authorised stations. All entrants agree to be bound by the rules of the contest.

4. Only the entrant will be permitted to operate the station for the duration of the contest.

5. Entries must be set out as shown in the example herewith, using one side of the paper only. Entries must be post-marked not later than February 11, 1957, and must be addressed to R.S.G.B. Contests Committee, New Ruskin House, 28-30 Little Russell St., London, W.C.1.

The closing date for acceptance of entries is March 31, 1957.

6. Operation is restricted to the following bands: 3.5, 7, 14, 21 and 28 Mc. Transmissions must be of type A1 (pure c.w.) only, and frequent tone reports of T8 or less may result in disqualification.

7. Entrants must operate within the terms of their licences. The input to the valve or valves delivering power to the aerial must not exceed 25 watts in the Senior section.

8. Contacts may be made with any station using a British Empire or DL2 call sign, except contacts within the entrant's own call area. British Isles stations may not work each other for points, and contacts with unlicensed stations in places where licences are obtainable will not count for points. The decision as to whether or not a station is valid will rest with the R.S.G.B. Contests Committee. Only one contact per band will count for points, but duplicate contacts should be logged.

9. Each completed contact will score 5 points. In addition a bonus of 20 pts. may be claimed for the first contact with each new Empire call area (as defined in the appendix) on each band. All British Isles stations (G, GC, GD, GI, GM and GW) count as only one call area.

10. Serial numbers must be exchanged and acknowledged before a contact can count for points. The serial number of 6 figures is made up of the RST report plus three figures which may start with any number between 001 and 100 for the first contact and will increase in value by one for each successive contact, e.g., 087 for the first and 088 for the second contact, etc.

11. A trophy or miniature will be awarded to the winner of each section, and certificates will be awarded to the

B.E.R.U. CONTEST, JANUARY 26-27, 1957

Name _____ Section _____ Claimed score _____
Address _____ Call Sign _____
Transmitter _____ Input _____ Watts _____
Receiver _____ Aerial(s) _____

Date	Band Mc	Time GMT	Call Sign of Station Worked	My Report on his Signals	His Report on my Signals	Points Claimed	Bonus Points	Leave blank
25	14	0005	G3XXX	590001	559002	5	20	
25	14	0009	VK2ZZ	579002	569034	5	20	
26	14	0012	GM3YY	569003	579012	5	—	
26	21	0730	GW3XX	589004	589054	5	20	
Total (points claimed plus bonus points)								
20 plus 60 equals 80.								

-Declaration: I hereby certify that I have operated within the terms of my licence and in accordance with the rules and spirit of the contest. I agree that the decision of the Council of the R.S.G.B. shall be final in all cases of dispute. I certify that the input power to the final stage of the transmitter was _____ watts.

Date _____ Signed _____

first three entrants in each section. In addition a certificate will be awarded to the leading entrant in each call area regardless of the number of entrants in his call area provided that his score exceeds 1,000 points in the Senior section or 500 points in the Junior section. A certificate will be awarded in each call area in which there are ten or more entrants, to the runner-up, provided his score exceeds 1,000 points in the Senior section or 500 points in the Junior section.

RECEIVING SECTION

1. To count for points the log must show in columns (a) date, (b) band, (c) Time G.M.T., (d) station heard, (e) serial number sent, (f) station worked, (g) points claimed, (h) bonus points claimed. CQ or Test calls will not count for points.

2. Each logging will score points in the same way as contacts in the Transmitting Contest (see Rule 9 earlier).

3. The same station may be logged only once on each band.

4. Logs must be addressed and post-marked as for entries in the Transmitting contest.

APPENDIX

The following call areas are recognised for the purpose of scoring in this contest:—

G, GC, GD, GI, GM, GW	VR1 (Gilbert & Ellice Islands).
MP4 (Bahrein, Muscat and Oman).	VR1 (Brit. Phoenix Is.).
MP4 (Trucial Oman).	VR3
VE1	VR4
VE2	VR5
VE3	VR6
VE4	VR1
VE5	VR2
VE6	VR3
VE7	VR4
VERA-L (Yukon Ter.)	VR5
VERM-Z (N.W. Ter.)	VR6 (Aden).
VK1 (Aus. Antarctic).	VR8 (Maldives Is.).
VK1 (Heard Island).	VU2
VK4 (Macquarie Is.).	VU4
VK3	ZB1
VK4	ZB2
VK3	ZC2
VK6	ZC3
VK7	ZC4
VK9 (Norfolk Is.).	ZC5
VK9 (Papua).	ZD1
VK3 (New Guinea, Bismark & Admiralty Is.).	ZD3
VO	ZD4
VPI (Leeward Is.).	ZD6
VP2 (Windward Is.).	ZD9
VP4	ZD1
VP5 (Jamaica).	ZK1 (Cook Islands).
VP5 (Cayman Is.).	ZK1 (Lord Howe Is.).
VP5 (Turks & Caicos Islands).	ZK2
VP7	ZL3
VP7	ZL3
VP8 (Falkland Is.).	ZL4
VP8 (Grahamland).	ZM8
VP8 (Sandwich Is.).	ZS1
VP8 (South Georgia).	ZS3
VP8 (St. Helena Is.).	ZS3
VP8 (St. Shetland Is.).	ZS4
VP9	ZS6
VQ1	ZS6
VQ2	ZS7
VQ3	ZS8
VQ4	ZS9
VQ5	AP
VQ6	ST2
VQ7 (Chagos).	457
VQ7 (Mauritius).	DL2

Reprinted from the R.S.G.B. "Bulletin," May, 1956.

DX ACTIVITY BY VK3AHH*

PROPAGATION REPORT

3.5 Mc.: The only report on conditions on this band refers to an opening to Asia, 1900-2000Z.

7 Mc.: Apart from the usual openings to the North American continent, contacts have been reported with Europe and Africa (1800-2000Z).

14 Mc.: Conditions seem to have deteriorated somewhat, although all continents could be contacted during the month. Openings to Africa and Europe were observed between 0700 and 0900, and 1900 and 2200Z. South America was represented around 1000-1200Z.

21 Mc.: Openings to the American continents (0100-0500Z and 0500-2200Z) and Europe and Africa (around 0500-0800Z, and 0900-1400Z) were not very reliable but provided reasonable contacts.

27/28 Mc.: During the month, this band opened to North and Central America (0100-0400Z) and Europe (0900-1200Z) according to reports.

NEWS AND NOTES

At the time of writing, Melbourne is enjoying one of the greatest privileges—that of being an Olympic City. Melbourne, as host to the XVI Olympiad, thus joins the rank of distinguished world capitals which have been host cities to one or more Olympiads during the last sixty years. In accordance with the true Olympic spirit, the Victorian Division of the W.I.A., through its Olympic Games Committee, has attempted to extend friendliest hospitality to Amateur visitors from overseas, and, I hope, we have been successful. The Olympic period saw the presence of the following DX Amateurs at W.I.A. functions:

Manuel XE2JK, Senator of the Republic of Mexico and Chief de Mission, Mexican Olympic Team.

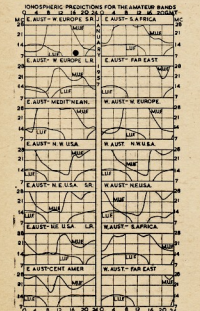
Bob YA1AA, Team Official, Afghan Olympic Team, ex-WBOMW.

1 Hans J. Albrecht, 10 Belgrave Ave., Box Hill North, E.12, Vic.

* Call signs and prefixes worked.

2—zero time—G.M.T.

PREDICTION CHART FOR JAN., '57



Armas OH2NB, Coach, Finnish Olympic Team.

Chester W0PBR, Manager, U.S. Olympic Cycling Team.

Other guests were ZM6AS, ZL2MN, ZL2SK, ZL2ABJ, and ZL2ABR.

The following news items have come to hand:

VR2DA is ex-VK2PA (from 2QL).

Although the call sign DU0RT has been allocated to W6ITH, for operation from Freedomland (Spratley Islands), no further information is available at this stage (from NCDXC).

It has been reported that the club station YI2AM is experiencing difficulty in renewing its licence (from W6YY).

QTHs OF INTEREST

(from W6YY, NCDXC, and VK7LZ, BERSHUS, and Rod de Balfour)

EL14—Sam Butler, Radio Station, Monrovia, Ex-KJ6BN—200 East McGraw Street, Rosewell, New Mexico, U.S.A.

EA9BJ—Via U.R.E.

EA9BA—Matti Vrolijk, Pantein weg 4, San Nicolas, Aruba, Netherlands West Indies.

KX3BG—Box 207, A.P.O. 433, San Francisco, California, U.S.A.

HR1LW—Box 93, Tegucigalpa, Honduras.

KT1AA—C/o American Legation, Tangiers Zone.

ACTIVITIES

3.5 Mc.: Frank 3QL heard USHKEP.

7 Mc.: 2AML reports EA4EB (0705Z), ZD6RM, Laurie ZANB adds ZD6RM, CRTAO, VQABD.

Y1GZC, ZSSB, ZS6AH, and ZSSB, ZSSB, ZSSB, ZSSB, FASBQ, DJ3HC, ZS3L, VU2RM, Neville 3APL worked KA4QL/KG8.

and JA8A5*. Dave W1A-1309 heard a long list of Ws.

14 Mc. C.W.: 3QL: HC1LE, HK3CR, and ZSM1.

7 Mc.: 3QL: VQ5GJ, ZC3JM, VQ4KL, P12ME, GY1X, VU2X, VU2X, VU2X, and EA8B.

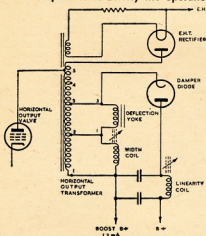
2AM: VP2LU, YU*, PZ1AP, CE-3DZ, VQ5GJ, ZD6RM, ZELV, VU*, ZS6R, ZS6R, and ZS6R.

3QL: GQ, CESC, KV4, VQ5AB, LURZ, VQ2GR, 2APL: CN8BK, EA*, G. Frank 3FO: HB, DL, F, SM, CT, PAH, OK, Doug 8BY: ZS6R, PZ1RH, JAH, HK, VQ5A (Cocos Is.).

Harry 5MY: PZ1RH, Ray 8RC: VU2KL, Col 7LZ: GM*, DL, ZBIZV, Eric BERSHUS: YD1D, F7AR, E1B, F7AB, F7AC, F7AD, F7AE, F7AF, F7AG, F7AH, F7AI, F7AJ, F7AK, F7AL, F7AM, F7AN, F7AO, F7AP, F7AQ, F7AR, F7AS, F7AT, F7AU, F7AV, F7AW, F7AX, F7AY, F7AZ, F7BA, F7BB, F7BC, F7BD, F7BE, F7BF, F7BG, F7BH, F7BI, F7BJ, F7BK, F7BL, F7BM, F7BN, F7BO, F7BP, F7BQ, F7BR, F7BS, F7BT, F7BU, F7BV, F7BW, F7BX, F7BY, F7BZ, F7CA, F7CB, F7CC, F7CD, F7CE, F7CF, F7CG, F7CH, F7CI, F7CJ, F7CK, F7CL, F7CM, F7CN, F7CO, F7CP, F7CQ, F7CR, F7CS, F7CT, F7CU, F7CV, F7CW, F7CX, F7CY, F7CZ, F7DA, F7DB, F7DC, F7DD, F7DE, F7DF, F7DG, F7DH, F7DI, F7DJ, F7DK, F7DL, F7DM, F7DN, F7DO, F7DP, F7DQ, F7DR, F7DS, F7DT, F7DU, F7DV, F7DW, F7DX, F7DY, F7DZ, F7EA, F7EB, F7EC, F7ED, F7EE, F7EF, F7EG, F7EH, F7EI, F7EJ, F7EK, F7EL, F7EM, F7EN, F7EO, F7EP, F7EQ, F7ER, F7ES, F7ET, F7EU, F7EV, F7EW, F7EX, F7EY, F7EZ, F7FA, F7FB, F7FC, F7FD, F7FE, F7FF, F7GG, F7GH, F7GI, F7GJ, F7GK, F7GL, F7GM, F7GN, F7GO, F7GP, F7GQ, F7GR, F7GS, F7GT, F7GU, F7GV, F7GW, F7GX, F7GY, F7GZ, F7HA, F7HB, F7HC, F7HD, F7HE, F7HF, F7HG, F7HH, F7HI, F7HJ, F7HK, F7HL, F7HM, F7HN, F7HO, F7HP, F7HQ, F7HR, F7HS, F7HT, F7HU, F7HV, F7HW, F7HX, F7HY, F7HZ, F7IA, F7IB, F7IC, F7ID, F7IE, F7IF, F7IG, F7IH, F7II, F7IJ, F7IK, F7IL, F7IM, F7IN, F7IO, F7IP, F7IQ, F7IR, F7IS, F7IT, F7IU, F7IV, F7IW, F7IX, F7IY, F7IZ, F7JA, F7JB, F7JC, F7JD, F7JE, F7JF, F7JG, F7JH, F7JI, F7JJ, F7JK, F7JL, F7JM, F7JN, F7JO, F7JP, F7JQ, F7JR, F7JS, F7JT, F7JU, F7JV, F7JW, F7JX, F7JY, F7JZ, F7KA, F7KB, F7KC, F7KD, F7KE, F7KF, F7KG, F7KH, F7KI, F7KJ, F7KL, F7KM, F7KN, F7KO, F7KP, F7KQ, F7KR, F7KS, F7KT, F7KU, F7KV, F7KW, F7KX, F7KY, F7KZ, F7LA, F7LB, F7LC, F7LD, F7LE, F7LF, F7LG, F7LH, F7LI, F7LJ, F7LK, F7LL, F7LM, F7LN, F7LO, F7LP, F7LQ, F7LR, F7LS, F7LT, F7LU, F7LV, F7LW, F7LX, F7LY, F7LZ, F7MA, F7MB, F7MC, F7MD, F7ME, F7MF, F7MG, F7MH, F7MI, F7MJ, F7MK, F7ML, F7MN, F7MO, F7MP, F7MQ, F7MR, F7MS, F7MT, F7MU, F7MV, F7MW, F7MX, F7MY, F7MZ, F7NA, F7NB, F7NC, F7ND, F7NE, F7NF, F7NG, F7NH, F7NI, F7NJ, F7NK, F7NL, F7NM, F7NN, F7NO, F7NP, F7NQ, F7NR, F7NS, F7NT, F7NU, F7NV, F7NW, F7NX, F7NY, F7NZ, F7OA, F7OB, F7OC, F7OD, F7OE, F7OF, F7OG, F7OH, F7OI, F7OJ, F7OK, F7OL, F7OM, F7ON, F7OO, F7OP, F7OQ, F7OR, F7OS, F7OT, F7OU, F7OV, F7OW, F7OX, F7OY, F7OZ, F7PA, F7PB, F7PC, F7PD, F7PE, F7PF, F7PG, F7PH, F7PI, F7PJ, F7PK, F7PL, F7PM, F7PN, F7PO, F7PP, F7PQ, F7PR, F7PS, F7PT, F7PU, F7PV, F7PW, F7PX, F7PY, F7PZ, F7QA, F7QB, F7QC, F7QD, F7QE, F7QF, F7QG, F7QH, F7QI, F7QJ, F7QK, F7QL, F7QM, F7QN, F7QO, F7QP, F7QQ, F7QR, F7QS, F7QT, F7QU, F7QV, F7QW, F7QX, F7QY, F7QZ, F7RA, F7RB, F7RC, F7RD, F7RE, F7RF, F7RG, F7RH, F7RI, F7RJ, F7RK, F7RL, F7RM, F7RN, F7RO, F7RP, F7RQ, F7RR, F7RS, F7RT, F7RU, F7RV, F7RW, F7RX, F7RY, F7RZ, F7SA, F7SB, F7SC, F7SD, F7SE, F7SF, F7SG, F7SH, F7SI, F7SJ, F7SK, F7SL, F7SM, F7SN, F7SO, F7SP, F7SQ, F7SR, F7SS, F7ST, F7SU, F7SV, F7SW, F7SX, F7SY, F7SZ, F7TA, F7TB, F7TC, F7TD, F7TE, F7TF, F7TG, F7TH, F7TI, F7TJ, F7TK, F7TL, F7TM, F7TN, F7TO, F7TP, F7TQ, F7TR, F7TS, F7TT, F7TU, F7TV, F7TW, F7TX, F7TY, F7TZ, F7UA, F7UB, F7UC, F7UD, F7UE, F7UF, F7UG, F7UH, F7UI, F7UJ, F7UK, F7UL, F7UM, F7UN, F7UO, F7UP, F7UQ, F7UR, F7US, F7UT, F7UU, F7UV, F7UW, F7UX, F7UY, F7UZ, F7VA, F7VB, F7VC, F7VD, F7VE, F7VF, F7VG, F7VH, F7VI, F7VJ, F7VK, F7VL, F7VM, F7VN, F7VO, F7VP, F7VQ, F7VR, F7VS, F7VT, F7VU, F7VW, F7VX, F7VY, F7VZ, F7WA, F7WB, F7WC, F7WD, F7WE, F7WF, F7WG, F7WH, F7WI, F7WJ, F7WK, F7WL, F7WM, F7WN, F7WO, F7WP, F7WQ, F7WR, F7WS, F7WT, F7WU, F7WV, F7WW, F7WX, F7WY, F7WZ, F7XA, F7XB, F7XC, F7XD, F7XE, F7XF, F7XG, F7XH, F7XI, F7XJ, F7XK, F7XL, F7XM, F7XN, F7XO, F7XP, F7XQ, F7XR, F7XS, F7XT, F7XU, F7XV, F7XW, F7XX, F7XY, F7XZ, F7YA, F7YB, F7YC, F7YD, F7YE, F7YF, F7YG, F7YH, F7YI, F7YJ, F7YK, F7YL, F7YM, F7YN, F7YO, F7YP, F7YQ, F7YR, F7YS, F7YT, F7YU, F7YV, F7YW, F7YX, F7YY, F7YZ, F7ZA, F7ZB, F7ZC, F7ZD, F7ZE, F7ZF, F7ZG, F7ZH, F7ZI, F7ZJ, F7ZK, F7ZL, F7ZM, F7ZN, F7ZO, F7ZP, F7ZQ, F7ZR, F7ZS, F7ZT, F7ZU, F7ZV, F7ZW, F7ZX, F7ZY, F7ZZ, F7AA, F7AB, F7AC, F7AD, F7AE, F7AF, F7AG, F7AH, F7AI, F7AJ, F7AK, F7AL, F7AM, F7AN, F7AO, F7AP, F7AQ, F7AR, F7AS, F7AT, F7AU, F7AV, F7AW, F7AX, F7AY, F7AZ, F7BA, F7BB, F7BC, F7BD, F7BE, F7BF, F7BG, F7BH, F7BI, F7BJ, F7BK, F7BL, F7BM, F7BN, F7BO, F7BP, F7BQ, F7BR, F7BS, F7BT, F7BU, F7BV, F7BW, F7BX, F7BY, F7BZ, F7CA, F7CB, F7CC, F7CD, F7CE, F7CF, F7CG, F7CH, F7CI, F7CJ, F7CK, F7CL, F7CM, F7CN, F7CO, F7CP, F7CQ, F7CR, F7CS, F7CT, F7CU, F7CV, F7CW, F7CX, F7CY, F7CZ, F7DA, F7DB, F7DC, F7DD, F7DE, F7DF, F7DG, F7DH, F7DI, F7DJ, F7DK, F7DL, F7DM, F7DN, F7DO, F7DP, F7DQ, F7DR, F7DS, F7DT, F7DU, F7DV, F7DW, F7DX, F7DY, F7DZ, F7EA, F7EB, F7EC, F7ED, F7EE, F7EF, F7EG, F7EH, F7EI, F7EJ, F7EK, F7EL, F7EM, F7EN, F7EO, F7EP, F7EQ, F7ER, F7ES, F7ET, F7EU, F7EV, F7EW, F7EX, F7EY, F7EZ, F7FA, F7FB, F7FC, F7FD, F7FE, F7FF, F7GG, F7GH, F7GI, F7GJ, F7GK, F7GL, F7GM, F7GN, F7GO, F7GP, F7GQ, F7GR, F7GS, F7GT, F7GU, F7GV, F7GW, F7GX, F7GY, F7GZ, F7HA, F7HB, F7HC, F7HD, F7HE, F7HF, F7HG, F7HH, F7HI, F7HJ, F7HK, F7HL, F7HM, F7HN, F7HO, F7HP, F7HQ, F7HR, F7HS, F7HT, F7HU, F7HV, F7HW, F7HX, F7HY, F7HZ, F7IA, F7IB, F7IC, F7ID, F7IE, F7IF, F7IG, F7IH, F7II, F7IJ, F7IK, F7IL, F7IM, F7IN, F7IO, F7IP, F7IQ, F7IR, F7IS, F7IT, F7IU, F7IV, F7IW, F7IX, F7IY, F7IZ, F7JA, F7JB, F7JC, F7JD, F7JE, F7JF, F7JG, F7JH, F7JI, F7JJ, F7JK, F7JL, F7JM, F7JN, F7JO, F7JP, F7JQ, F7JR, F7JS, F7JT, F7JU, F7JV, F7JW, F7JX, F7JY, F7JZ, F7KA, F7KB, F7KC, F7KD, F7KE, F7KF, F7KG, F7KH, F7KI, F7KJ, F7KL, F7KM, F7KN, F7KO, F7KP, F7KQ, F7KR, F7KS, F7KT, F7KU, F7KV, F7KW, F7KX, F7KY, F7KZ, F7LA, F7LB, F7LC, F7LD, F7LE, F7LF, F7LG, F7LH, F7LI, F7LJ, F7LK, F7LM, F7LN, F7LO, F7LP, F7LQ, F7LR, F7LS, F7LT, F7LU, F7LV, F7LW, F7LX, F7LY, F7LZ, F7MA, F7MB, F7MC, F7MD, F7ME, F7MF, F7MG, F7MH, F7MI, F7MJ, F7MK, F7ML, F7MN, F7MO, F7MP, F7MQ, F7MR, F7MS, F7MT, F7MU, F7MV, F7MW, F7MX, F7MY, F7MZ, F7NA, F7NB, F7NC, F7ND, F7NE, F7NF, F7NG, F7NH, F7NI, F7NJ, F7NK, F7NL, F7NM, F7NN, F7NO, F7NP, F7NQ, F7NR, F7NS, F7NT, F7NU, F7NV, F7NW, F7NX, F7NY, F7NZ, F7OA, F7OB, F7OC, F7OD, F7OE, F7OF, F7OG, F7OH, F7OI, F7OJ, F7OK, F7OL, F7OM, F7ON, F7OO, F7OP, F7OQ, F7OR, F7OS, F7OT, F7OU, F7OV, F7OW, F7OX, F7OY, F7OZ, F7PA, F7PB, F7PC, F7PD, F7PE, F7PF, F7PG, F7PH, F7PI, F7PJ, F7PK, F7PL, F7PM, F7PN, F7PO, F7PP, F7PQ, F7PR, F7PS, F7PT, F7PU, F7PV, F7PW, F7PX, F7PY, F7PZ, F7QA, F7QB, F7QC, F7QD, F7QE, F7QF, F7QG, F7QH, F7QI, F7QJ, F7QK, F7QL, F7QM, F7QN, F7QO, F7QP, F7QQ, F7QR, F7QS, F7QT, F7QU, F7QV, F7QW, F7QX, F7QY, F7QZ, F7RA, F7RB, F7RC, F7RD, F7RE, F7RF, F7RG, F7RH, F7RI, F7RJ, F7RK, F7RL, F7RM, F7RN, F7RO, F7RP, F7RQ, F7RR, F7RS, F7RT, F7RU, F7RV, F7RW, F7RX, F7RY, F7RZ, F7SA, F7SB, F7SC, F7SD, F7SE, F7SF, F7SG, F7SH, F7SI, F7SJ, F7SK, F7SL, F7SM, F7SN, F7SO, F7SP, F7SQ, F7SR, F7SS, F7ST, F7SU, F7SV, F7SW, F7SX, F7SY, F7SZ, F7TA, F7TB, F7TC, F7TD, F7TE, F7TF, F7TG, F7TH, F7TI, F7TJ, F7TK, F7TL, F7TM, F7TN, F7TO, F7TP, F7TQ, F7TR, F7TS, F7TT, F7TU, F7TV, F7TW, F7TX, F7TY, F7TZ, F7UA, F7UB, F7UC, F7UD, F7UE, F7UF, F7UG, F7UH, F7UI, F7UJ, F7UK, F7UL, F7UM, F7UN, F7UO, F7UP, F7UQ, F7UR, F7US, F7UT, F7UU, F7UV, F7UW, F7UX, F7UY, F7UZ, F7VA, F7VB, F7VC, F7VD, F7VE, F7VF, F7VG, F7VH, F7VI, F7VJ, F7VK, F7VL, F7VM, F7VN, F7VO, F7VP, F7VQ, F7VR, F7VS, F7VT, F7VU, F7VW, F7VX, F7VY, F7VZ, F7WA, F7WB, F7WC, F7WD, F7WE, F7WF, F7WG, F7WH, F7WI, F7WJ, F7WK, F7WL, F7WM, F7WN, F7WO, F7WP, F7WQ, F7WR, F7WS, F7WT, F7WU, F7WV, F7WW, F7WX, F7WY, F7WZ, F7XA, F7XB, F7XC, F7XD, F7XE, F7XF, F7XG, F7XH, F7XI, F7XJ, F7XK, F7XL, F7XM, F7XN, F7XO, F7XP, F7XQ, F7XR, F7XS, F7XT, F7XU, F7XV, F7XW, F7XX, F7XY, F7XZ, F7YA, F7YB, F7YC, F7YD, F7YE, F7YF, F7YG, F7YH, F7YI, F7YJ, F7YK, F7YL, F7YM, F7YN, F7YO, F7YP, F7YQ, F7YR, F7YS, F7YT, F7YU, F7YV, F7YW, F7YX, F7YY, F7YZ, F7ZA, F7ZB, F7ZC, F7ZD, F7ZE, F7ZF, F7ZG, F7ZH, F7ZI, F7ZJ, F7ZK, F7ZL, F7ZM, F7ZN, F7ZO, F7ZP, F7ZQ, F7ZR, F7ZS, F7ZT, F7ZU, F7ZV, F7ZW, F7ZX, F7ZY, F7ZZ, F7AA, F7AB, F7AC, F7AD, F7AE, F7AF, F7AG, F7AH, F7AI, F7AJ, F7AK, F7AL, F7AM, F7AN, F7AO, F7AP, F7AQ, F7AR, F7AS, F7AT, F7AU, F7AV, F7AW, F7AX, F7AY, F7AZ, F7BA, F7BB, F7BC, F7BD, F7BE, F7BF, F7BG, F7BH, F7BI, F7BJ, F7BK, F7BL, F7BM, F7BN, F7BO, F7BP, F7BQ, F7BR, F7BS, F7BT, F7BU, F7BV, F7BW, F7BX, F7BY, F7BZ, F7CA, F7CB, F7CC, F7CD, F7CE, F7CF, F7CG, F7CH, F7CI, F7CJ, F7CK, F7CL, F7CM, F7CN, F7CO, F7CP, F7CQ, F7CR, F7CS, F7CT, F7CU, F7CV, F7CW, F7CX, F7CY, F7CZ, F7DA, F7DB, F7DC, F7DD, F7DE, F7DF, F7DG, F7DH, F7DI, F7DJ, F7DK, F7DL, F7DM, F7DN, F7DO, F7DP, F7DQ, F7DR, F7DS, F7DT, F7DU, F7DV, F7DW, F7DX, F7DY, F7DZ, F7EA, F7EB, F7EC, F7ED, F7EE, F7EF, F7EG, F7EH, F7EI, F7EJ, F7EK, F7EL, F7EM, F7EN, F7EO, F7EP, F7EQ, F7ER, F7ES, F7ET, F7EU, F7EV, F7EW, F7EX, F7EY, F7EZ, F7FA, F7FB, F7FC, F7FD, F7FE, F7FF, F7GG, F7GH, F7GI, F7GJ, F7GK, F7GL, F7GM, F7GN, F7GO, F7GP, F7GQ, F7GR, F7GS, F7GT, F7GU, F7GV, F7GW, F7GX, F7GY, F7GZ, F7HA, F7HB, F7HC, F7HD, F7HE, F7HF, F7HG, F7HH, F7HI, F7HJ, F7HK, F7HL, F7HM, F7HN, F7HO, F7HP, F7HQ, F7HR, F7HS, F7HT, F7HU, F7HV, F7HW, F7HX, F7HY, F7HZ, F7IA, F7IB, F7IC, F7ID, F7IE, F7IF, F7IG, F7IH, F7II, F7IJ, F7IK, F7IL, F7IM, F7IN, F7IO, F7IP, F7IQ, F7IR, F7IS, F7IT, F7IU, F7IV, F7IW, F7IX, F7IY, F7IZ, F7JA, F7JB, F7JC, F7JD, F7JE, F7JF, F7JG, F7JH, F7JI, F7JJ, F7JK, F7JL, F7JM, F7JN, F7JO, F7JP, F7JQ, F7JR, F7JS, F7JT, F7JU, F7JV, F7JW, F7JX, F7JY, F7JZ, F7KA, F7KB, F7KC, F7KD, F7KE, F7KF, F7KG, F7KH, F7KI, F7KJ, F7KL, F7KM, F7KN, F7KO, F7KP, F7KQ, F7KR, F7KS, F7KT, F7KU, F7KV, F7KW, F7KX, F7KY, F7KZ, F7LA, F7LB, F7LC, F7LD, F7LE, F7LF, F7LG, F7LH, F7LI, F7LJ, F7LK, F7LM, F7LN, F7LO, F7LP, F7LQ, F7LR, F7LS, F7LT, F7LU, F7LV, F7LW, F7LX, F7LY, F7LZ, F7MA, F7MB, F7MC, F7MD, F7ME, F7MF, F7MG, F7MH, F7MI, F7MJ, F7MK, F7ML, F7MN, F7MO, F7MP, F7MQ, F7MR, F7MS, F7MT, F7MU, F7MV, F7MW, F7MX, F7MY, F7MZ, F7NA, F7NB, F7NC, F7ND, F7NE, F7NF, F7NG, F7NH, F7NI, F7NJ, F7NK, F7NL, F7NM, F7NN, F7NO, F7NP, F7NQ, F7NR, F7NS, F7NT, F7NU, F7NV, F7NW, F7NX, F7NY, F7NZ, F7OA, F7OB, F7OC, F7OD, F7OE, F7OF, F7OG, F7OH, F7OI, F7OJ, F7OK, F7OL, F7OM, F7ON, F7OO, F7OP, F7OQ, F7OR, F7OS, F7OT, F7OU, F7OV, F7OW, F7OX, F7OY, F7OZ, F7PA, F7PB, F7PC, F7PD, F7PE, F7PF, F7PG, F7PH, F7PI, F7PJ, F7PK, F7PL, F7PM, F7PN, F7PO, F7PP, F7PQ, F7PR, F7PS, F7PT, F7PU, F7PV, F7PW, F7PX, F7PY, F7PZ, F7QA, F7QB, F7QC, F7QD, F7QE, F7QF, F7QG, F7QH, F7QI, F7QJ, F7QK, F7QL, F7QM, F7QN, F7QO, F7QP, F7QQ, F7QR, F7QS, F7QT, F7QU, F7QV, F7QW, F7QX, F7QY, F7QZ, F7RA, F7RB, F7RC, F7RD, F7RE, F7RF, F7RG, F7RH, F7RI, F7RJ, F7RK, F7RL, F7RM, F7RN, F7RO, F7RP, F7RQ, F7RR, F7RS, F7RT, F7RU, F7RV, F7RW, F7RX, F7RY, F7RZ, F7SA, F7SB, F7SC, F7SD, F7SE, F7SF, F7SG, F7SH, F7SI, F7SJ, F7SK, F7SL, F7SM, F7SN, F7SO, F7SP, F7SQ, F7SR, F7SS, F7ST, F7SU, F7SV, F7SW, F7SX, F7SY, F7SZ, F7TA, F7TB, F7TC, F7TD, F7TE, F7TF, F7TG, F7TH, F7TI, F7TJ, F7TK, F7TL, F7TM, F7TN, F7TO, F7TP, F7TQ, F7TR, F7TS, F7TT, F7TU, F7TV, F7TW, F7TX, F7TY, F7TZ, F7UA, F7UB, F7UC, F7UD, F7UE, F7UF, F7UG, F7UH, F7UI, F7UJ, F7UK, F7UL, F7UM, F7UN, F7UO, F7UP, F7UQ, F7UR, F7US, F7UT, F7UU, F7UV, F7UW, F7UX, F7UY, F7UZ, F7VA, F7VB, F7VC, F7VD, F7VE, F7VF, F7VG, F7VH, F7VI, F7VJ, F7VK, F7VL, F7VM, F7VN, F7VO, F7VP, F7VQ, F7VR, F7VS, F7VT, F7VU, F7VW, F7VX, F7VY, F7VZ, F7WA, F7WB, F7WC, F7WD, F7WE, F7WF, F7WG, F7WH, F7WI, F7WJ, F7WK, F7WL, F7WM, F7WN, F7WO, F7WP, F7WQ, F7WR, F7WS, F7WT, F7WU, F7WV, F7WW, F7WX, F7WY, F7WZ, F7XA, F7XB, F7XC, F7XD, F7XE, F7XF, F7XG, F7XH, F7XI, F7XJ, F7XK, F7XL, F7XM, F7XN, F7XO, F7XP, F7XQ, F7XR, F7XS, F7XT, F7XU, F7XV, F7XW, F7XX, F7XY, F7XZ, F7YA, F7YB, F7YC, F7YD, F7YE, F7YF, F7YG, F7YH, F7YI, F7YJ, F7YK, F7YL, F7YM, F7YN, F7YO, F7YP, F7YQ, F7YR, F7YS, F7YT, F7YU, F7YV, F7YW, F7YX, F7YY, F7YZ, F7ZA, F7ZB, F7ZC, F7ZD, F7ZE, F7ZF, F7ZG, F7ZH, F7ZI, F7ZJ, F7ZK, F7ZL, F7ZM, F7ZN, F7ZO, F7ZP, F7ZQ, F7ZR, F7ZS, F7ZT, F7ZU, F7ZV, F7ZW, F7ZX, F7ZY, F7ZZ, F7AA, F7AB, F7AC, F7AD, F7AE, F7AF, F7AG, F7AH, F7AI, F7AJ, F7AK, F7AL, F7AM, F7AN, F7AO, F7AP, F7AQ, F7AR, F7AS, F7AT, F7AU, F7AV, F7AW, F7AX, F7AY, F7AZ, F7BA, F7BB, F7BC, F7BD, F7BE, F7BF, F7BG, F7BH, F7BI, F7BJ, F7BK, F7BL, F7BM, F7BN, F7BO, F7BP, F7BQ, F7BR, F7BS, F7BT, F7BU, F7BV, F7BW, F7BX, F7BY, F7BZ, F7CA, F7CB, F7CC, F7CD, F7CE, F7CF, F7CG, F7CH, F7CI, F7CJ, F7CK, F7CL, F7CM, F7CN, F7CO, F7CP, F7CQ, F7CR, F7CS, F7CT, F7CU, F7CV, F7CW, F7CX, F7CY, F7CZ, F7DA, F7DB, F7DC, F7DD, F7DE, F7DF, F7DG, F7DH, F7DI, F7DJ, F7DK, F7DL, F7DM, F7DN, F7DO, F7DP, F7DQ, F7DR, F7DS, F7DT, F7DU, F7DV, F7DW, F7DX, F7DY, F7DZ, F7EA, F7EB, F7EC, F7ED, F7EE, F7EF, F7EG, F7EH, F7EI, F7EJ, F7EK, F7EL, F7EM, F7EN, F7EO, F7EP, F7EQ, F7ER, F7ES, F7ET, F7EU, F7EV, F7EW, F7EX, F7EY, F7EZ, F7FA, F7FB, F7FC, F7FD, F7FE, F7FF, F7GG, F7GH, F7GI, F7GJ, F7GK, F7GL, F7GM, F7GN, F7GO, F7GP, F7GQ, F7GR, F7GS, F7GT, F7GU, F7GV, F7GW, F7GX, F7GY, F7GZ, F7HA, F7HB, F7HC, F7HD, F7HE, F7HF, F7HG, F7HH, F7HI, F7HJ, F7HK, F7HL, F7HM, F7HN, F7HO, F7HP, F7HQ, F7HR, F7HS, F7HT, F7HU, F7HV, F7HW, F7HX, F7HY, F7HZ, F7IA, F7IB, F7IC, F7ID, F7IE, F7IF, F7IG, F7IH, F7II, F7IJ, F7IK, F7IL, F7IM, F7IN, F7IO, F7IP, F7IQ, F7IR, F7IS, F7IT, F7IU, F7IV, F7IW, F7IX, F7IY, F7IZ, F7JA, F7JB, F7JC, F7JD, F7JE, F7JF, F7JG, F7JH, F7JI, F7JJ, F7JK, F7JL, F7JM, F7JN, F7JO, F7JP, F7JQ, F7JR, F7JS, F7JT, F7JU, F7JV, F7JW, F7JX, F7JY, F7JZ, F7KA, F7KB, F7KC, F7KD, F7KE, F7KF, F7KG, F7KH, F7KI, F7KJ, F7KL, F7KM, F7KN, F7KO, F7KP, F7KQ, F7KR, F7KS, F7KT, F7KU, F7KV, F7KW, F7KX, F7KY, F7KZ, F7LA, F7LB, F7LC, F7LD, F7LE, F7LF, F7LG, F7LH, F7LI, F7LJ, F7LK, F7LM, F7LN, F7LO, F7LP, F7LQ, F7LR, F7LS, F7LT, F7LU, F7LV, F7LW, F7LX, F7LY, F7LZ, F7MA, F7MB, F7MC, F7MD, F7ME, F7MF, F7MG, F7MH, F7MI, F7MJ, F7MK, F7ML, F7MN, F7MO, F7MP, F7MQ, F7MR, F7MS, F7MT, F7MU, F7MV, F7MW, F7MX, F7MY, F7MZ, F7NA, F7NB, F7NC, F7ND, F7NE, F7NF, F7NG, F7NH, F7NI, F7NJ, F7NK, F7NL, F7NM, F7NN, F7NO, F7NP, F7NQ, F7NR, F7NS, F7NT, F7NU, F7NV, F7NW, F7NX, F7NY, F7NZ, F7OA, F7OB, F7OC, F7OD, F7OE, F7OF, F7OG, F7OH, F7OI, F7OJ, F7OK, F7OL, F7OM, F7ON, F7OO, F7OP, F7OQ, F7OR, F7OS, F7OT, F7OU, F7OV, F7OW, F7OX, F7OY, F7OZ

RADIOTRON TELEVISION VALVE SERIES

The damper diode in a TV receiver increases the efficiency of operation of the horizontal deflection circuit by recovering energy from the magnetic field which is set up — in the yoke and output transformer — by current from the output valve. Briefly the operation is:—



SIMPLIFIED DIAGRAM OF HORIZONTAL OUTPUT AND E.H.T. CIRCUITS.

- (1) A voltage of approximately saw-tooth wave-form is applied to the grid of the horizontal output valve with the "pulse" of the saw-tooth in a negative direction.
- (2) This negative pulse in the grid wave-form cuts off the plate current of the horizontal output valve so that a large positive pulse is developed across the inductance of the horizontal output transformer.
- (3) This positive pulse sets up, and becomes the first quarter-cycle of, a damped high-frequency oscillation in the plate circuit.
- (4) During the first half-cycle of the damped oscillation the cathode of the damper diode is positive with respect to the plate and the damper diode cannot conduct.
- (5) During the second half-cycle the cathode becomes negative with respect to the plate causing the damper diode to conduct.

(6) The diode conduction current flowing in the horizontal output transformer (and thus in the yoke) is in fact the first part of the sweep deflection current in the yoke.

(7) As the damper-diode current decreases towards zero, the saw-tooth voltage on the grid of the horizontal output valve is passing from cut-off to less-negative and then positive grid voltages.

(8) The horizontal output valve consequently starts to conduct and draws a steadily increasing plate current through the output transformer and yoke thereby providing the second half of the sweep current.

(9) During the period of damper-diode conduction the horizontal output valve is cut off and current flows into the capacitor across the linearity coils, charging them to a voltage some hundreds of volts higher than the normal B+ supply voltage.

(10) The plate of the horizontal output valve is supplied from this boost supply, thereby making use of the power recovered by the damper diode from the magnetic field of the deflection yoke and output transformer.

The damper diode thus provides the first half of each cycle of deflection current in the yoke by rectifying the damped oscillation in the output transformer and then allows the power recovered to be used in the plate circuit of the horizontal output valve.

CHARACTERISTICS:

HEATER VOLTAGE	6.3 volts
HEATER CURRENT	1.2 amps.
CAPACITANCE (Heater to cathode)	7.5 μ F

MAXIMUM RATINGS (damper service)

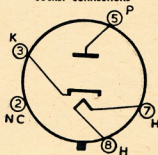
PEAK INVERSE PLATE VOLTAGE* (absolute max.)	4400 volts
PEAK PLATE CURRENT	750 mA
AVERAGE PLATE CURRENT	125 mA
PLATE DISSIPATION	4.8 watts
PEAK HEATER-CATHODE VOLTAGE (absolute max.)	4400 volts
(heater negative with respect to cathode).	

*The duration of the voltage pulse must not exceed 15% of one horizontal scanning cycle. For further information on the 6AX4GT and other Radiotron Television Valves, consult the TV1 Booklet. Additional copies of this advertisement are available free and post free on request.



6AX4GT[†]

SOCKET CONNECTIONS



(bottom view)

- Pin 2 — No Connection
(Do not use.)
Pin 3 — Cathode
Pin 5 — Plate
Pin 7 — Heater
Pin 8 — Heater



AMALGAMATED WIRELESS VALVE CO. PTY. LTD.

47 YORK ST., SYDNEY

Australian DX C.C. Alphabetical List of Countries by Prefix

The list of Countries hereunder and as amended from time to time in Federal Awards Notes is the Official List to be used in connection with the issue of the Australian DX C.C. Award.

The list below shows first the Prefix, the Country, and the Zone Numbers in parenthesis (as used for "CQ" W.A.Z. Award).

AC3-Siddim	(22)
AC4-Tibet	(23)
AP-Pakistan	(21, 22)
BV (C3)-Formosa	(24)
C (unofficial)-China	(23, 24)
C3-See BV.	
C9-Manchuria	(24)
CE-Chile	(12)
CE7Z, LU-Z, VK1, VP8, Antarctica	(13, 29, 30)
CE0-Easter Island	(12)
CM, CO-Cuba	(8)
CN2, KT1-Tangier Zone	(33)
CN8-French Morocco	(33)
CR-Bolivia	(10)
CR4-Cape Verde Is.	(35)
CR5-Port. Guinea	(35)
CR8-Principe, Sao Thome	(36)
CR6-Angola	(36)
CR7-Mozambique	(37)
CR8-Goa (Port. India)	(22)
CR9-Macau	(24)
CR10-Port. Timor	(28)
CT1-Portugal	(14)
CT2-Azores Is.	(14)
CT3-Madeira Is.	(33)
CX-Uruguay	(13)
DI, DL, DM-Germany	(14, 15)
DJ-Philippine Is.	(27)
EA-Spain	(14)
EA6-Baleares Is.	(14)
EA8-Canary Is.	(33)
EA9-Irni	(33)
EA9-Rio de Oro	(33)
EA9-Spanish Morocco	(33)
EA0-Spanish Guinea	(35)
EL-Eire	(14)
EL-Liberia	(35)
EQ-Iran	(37)
ET2-Eritrea	(37)
ET3-Ethiopia	(37)
F-France	(14)
FA-Algeria	(33)
FB8-Amsterdam and St. Paul Is.	(39)
FB8-Kerguelen Is.	(39)
FB8-Madagascar	(39)
FC-Corsica	(15)
FD-Fr. Togoland	(35)
FE8-Fr. Cameroons	(36)
FF8-Fr. West Africa	(35)
FG-Guadeloupe	(8)
FG-Saint Martin Is.	(8)
FI8-Vietnam	(26)
FK8-New Caledonia	(32)
FL8-Fr. Somaliland	(37)
FM-Martinique	(8)
F08-Clipperton Is.	(7)
F08-Fr. Oceania	(32)
FP8-St. Pierre and Miquelon Is.	(5)
FQ8-Fr. Equat. Africa	(36)
FR7-Reunion Is.	(39)
FU8, YJ-New Hebrides	(32)
FW8-Wallis & Futuna Is.	(32)
FY7-Fr. Guiana and Inini	(9)
G-Gotland	(14)
GC-Channel Is.	(14)
GD-Isle of Man	(14)
GI-Northern Ireland	(14)
GM-Scotland	(14)
GW-Wales	(14)
HA-Hungary	(15)

PJ2M-Sint Marteen Is.	(9)
PK1, 2, 3-Java	(28)
PK4-Sumatra	(28)
PK5-Borneo (Indonesias)	(28)
PK6-Celebes & Molucca Is.	(28)
PX-Andorra	(14)
PY-Brazil	(11)
PZ1-Neth. Guiana	(9)
SM-Sweden	(14)
SP-Poland	(15)
ST-Anglo-Egyptian Sudan	(34)
SU-Egypt	(34)
SV-Greece	(20)
SV-Crete	(20)
SV-Dodecanese Is.	(20)
TA-Turkey	(20)
TF-Iceland	(40)
TG-Guatemala	(7)
TI-Costa Rica	(7)
TI9-Cocos Is.	(7)
UA1, 3, 4, 6-European R.S.F.S.R.	(15, 16, 17)
UA9, 0-Asiatic R.S.F.S.R.	(17, 18, 19, 25)
UB5-Ukraine	(16)
UC2-White Russia S.S.R.	(16)
UD6-Azerbaijan	(21)
UF6-Georgia	(21)
UG6-Armenia	(21)
UH6-Turkmen	(17)
UI8-Tadzhik	(17)
UL7-Kazakh	(17)
UM8-Kirghiz	(17)
UN1-Karelo-Finnish	(16)
UO5-Moldavia	(16)
UP2-Lithuania	(15)
UQ2-Latvia	(15)
UR2-Estonia	(15)
VE, VO-Canada	(2, 3, 4, 5)
VK-Australia	(29, 30)
VK1-See CE7Z.	
VK1-Heard Is.	(39)
VK1-Macquarie Is.	(30)
VK9, ZC2-Cocos Is.	(29)
VK9-Nauru Is.	(28)
VK9-Norfolk Is.	(32)
VK9-Papua New Guinea	(28)
VO-See VE.	
VP1-Br. Honduras	(7)
VP2-Bermuda Is.	(8)
VP2-Howland Is.	(8, 9)
VP3-Br. Guiana	(8)
VP4-Trinidad & Tobago	(8)
VP5-Cayman Is.	(8)
VP5-Jamaica	(8)
VP5-Turks & Caicos Is.	(8)
VP6-Barbados	(8)
VP7-Bahamas Is.	(8)
VP8-See CE7.	
VP8-Falkland Is.	(13)
VP8-South Georgia Is.	(13)
VP8-South Orkney Is.	(13)
VP8-South Sandwich Is.	(13)
VP8-Shetland Is.	(13)
VP9-Bermuda	(5)
VQ1-Zanzibar	(37)
VQ2-Northern Rhodesia	(37)
VQ3-Tanganyika	(37)
VQ4-Kenya	(37)
VQ5-Uganda	(37)
VQ6-Br. Somaliland	(37)
VQ8-Chagos Is.	(39)
VQ8-Mauritius	(39)
VQ8-Seychelles	(39)
VR1-Gilbert, Ellis & Ocean Is.	(31)
VR2-Fiji Is.	(32)
VR3-Fanning Is. Group	(31)
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VR5-Tonga Is.	(32)
VR6-Pitcairn Is.	(32)
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VS2-Malaya	(28)
V84-Sarawak	(28)
V85-Brunel	(28)
V86-Hong Kong	(24)
V87-Aden and Socotra	(21)
V89-Maldives Is.	(22)
V9-Sultanate of Oman	(21)
VU2-India	(22)
VU4-Laccadive Is.	(22)
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XE-Mexico	(6)
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XZ-Burma	(26)
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YI-Iraq	(21)
YJ-See FUB.	
YK-Syria	(20)
YN-Nicaragua	(7)
YO-Roumania	(20)
YS-Salvador	(7)
YU-Yugoslavia	(15)
YV-Venezuela	(9)
ZA-Albania	(15)
ZB1-Malta	(15)
ZB2-Gibraltar	(14)
ZB3-CZK9.	
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ZC5-Br. North Borneo	(28)
ZC6-Palestine	(20)
ZC7-See JY.	
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Nepal	(22)
Tromelin Is.	(37)
Wrangel Is.	(19)

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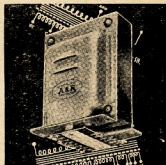
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OLYMPIC MESSAGE

VK3WI co-operated recently with VK7W1 in receiving a message of greeting from the Greek Radio Amateurs in connection with the Olympic Games in Melbourne. The message was transmitted from Mt. Olympus in Greece to VK7W1, operating portable from Mt. Olympus in Tasmania and was later passed on to VK3WI and handed to the Chief Executive Officer, Olympic Games Committee in Melbourne.

The message read as follows:—

"From Attica Amateur Radio Club, VSVISV, to Wireless Institute of Australia, Tasmanian Division, portable VK7W1, on the occasion of the beginning of XVI Olympiad in Melbourne. We, the Greek Radio Amateurs, address

our warmest greetings to our Australian colleagues and ask you to transmit the following message to the Committee organising the Olympic Games in Australia. This message is communicated from the place of Olympia where the holy light remains burning since three thousand years ago symbolising the idea of courteous competition in peaceful achievements. 'We wish the knightly spirit and the faith in ideals which expresses the meaning of Olympiad prevail in this magnificent gathering in Melbourne, and in the conscience of world-wide athletic youth'.

It may interest members to know that the Tasmanian Tourist Bureau office in Collins Street, Melbourne, made a small display of this message.

Somewhere around twenty minutes later, when we had been in on the first "Kill," I started getting interested and before the night was over I'd caught the bug and was really enjoying it, in spite of myself.

During the course of action we all got somewhat overheated with excitement. In my case as much from the constant barrage of directions that had been fired at me with machine-gun like precision, by my OM. Such things as "You're over the line," "Turn right next corner," "Go back a bit," "Not that way. Log. I meant back there." Oh my! The harmonics too came in for a bit of chastising. "Quiet in the back there. Look! you'll stay home next time." While I muttered to myself, "if there is a next time."

At last, after a chase here and there and finding ourselves in some very queer places, the "Pack" descended on the "Prey" from all sides at the final location of the evening. This being the home of the Amateur Fraternity and his YXL who had kindly thrown open their door to us all. Over our supper of sandwiches and Thermos hot teas, we nattered and tallied up our points which were divided into the miles travelled. The lowest score of them all winning the "Meet." The "Pack" had a hard time of it. "No 'Ham' would be guilty of calling on another without a quick look over the 'Shack'" and after a hearty round of "Goodnight all," each went home. "Steed's" nose for home. My OM, now driving, turned to me and with a very satisfied grin, said, "Well, what about it now? Will we be in the next Hunt?" And what did I say? "You bet we will." While from the back seat came a chorus of contented snores from our harmonics.

The Fox Hunts and likewise the Transmitter Hunts have three very keen fans at our QTH here. "No Ham" would be guilty of calling on another without a quick look over the "Shack" and after a hearty round of "Goodnight all," each went home. "Steed's" nose for home. My OM, now driving, turned to me and with a very satisfied grin, said, "Well, what about it now? Will we be in the next Hunt?" And what did I say? "You bet we will." While from the back seat came a chorus of contented snores from our harmonics.

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S.W.L. SECTION

The Christmas season having passed, now comes the time for making those New Year resolutions. So why not first of all resolve to put pen to paper and tell me a little of YOUR year? I'm sure I'll be glad to hear from you. So far we have heard from the following VK areas: VK2, 3, 4, 5, 6, and 7, in other words all mainland States and Tasmania. How about the VK areas? Are VK9 boys making yourselves known? Still, I hope you have enjoyed the year just passed and wish us all the best for this coming one. But, please, please try and help us make a bumper show for our notes from now on.

NEW SOUTH WALES

Key Clicks are audible against the background of motor engines roaring in Coolamon again this month. Our most consistent VK3 correspondent, Mr. Abbey, is unable to do either with his radio gear or not. However, I believe that he has not done much listening but instead has been rampaging around

* Compiled by Ian J. Hunt, W1A-1307, 211 St. George's Road, Northcote, N.16, Vic.

showing off his driving skill. Jack Ashley, from the same village (or is it a town boy?) has been experimenting with a converter for 19 Mc. his rx has not been functioning so well on that band. Jack is evidently leaning up the gear preparatory to cleaning up the DX in this new year. I'm also told that A.M. has been a topic of much interest to a couple of the locals, namely 2AJO and 2ZBJ.

Stan said it was good to learn of another VKJ listener, but he thinks there must be more. He suggests they may be interested in seeing their names in print or maybe they can't write. Come on you VKJs and let's hear more about a topic of much interest to us. During these days, busy building a t.v. rx or some such small item Bill!

VICTORIA

November Group meeting.—This meeting was held on Tuesday, 27th, at the rooms, 191 Queen St., Melbourne; thirteen members being present. Mr. Hilliard was in the chair, and welcomed to the premier State to stay. Frank Nolan reported on band conditions, while Michael Ide reported on his activities in general and also made a brief but most interesting description of his tape recorder (home built of course). Ian Hunt was asked a question as to what happened at the Olympiad in Greece.

It was decided that no meeting will be held for the month of December due to the holidays and that the January meeting would be a free night. So come along and join in our activities as you can be assured of a most interesting time. The Group meets on the last Tuesday of each month at 8 p.m. at the address given above.

To conclude the November meeting Ian Hunt gave a talk on antennae and described many of his experiments with the line. The talk was kept elementary for the sake of the younger members and it is hoped that they learnt at least a little.

VK3 Correspondence.—That unrelenting cow-homboy, Dave Jenkin, has managed to milk a little more ink from his pen to keep us in the picture of the latest doings in Orbest. He has been writing to me for some time, and KHEs on 7 Mc. c.w. and also an 11 on that band. His new rx is now completed except for a motor. He says it is a very good one, but have just been twisted. However, despite oscillator trouble he feels that he's now getting somewhere with it at last! I guess it will be more of a happy operating by the time this appears in print.

Another very interesting letter was received from Len Cragan, who travelled in his car to the tells of the Convention recently held in Leon. g.a. It appears that Henry was the only e.w.l. and associate present full time at the Convention. He was also present at the Saturday night meeting and one of our best known associate members, Phil (boy scout) mentioned that he was present. Some associates were represented. Whilst activities were in progress Henry picked up some experience in the tx hunt and says that next time he'll bring his own hunting gear.

Bert Stebbing was present at the recent tx hunt of the elusive apparatus and couldn't seem to find it. Ian Hunt salvaged quite a few of the antenna from amongst the trees but found himself on the wrong side of the river. He might have been a bit of a fool, but it seemed that a visiting YL Amateur was in danger of falling into the Yarra River. (No! No notes on the end of the wire, Geoff.) I suspect Len Foster may appear at the catfish dinner hanging around his ears soon. He's apparently getting really stuck into this t.v. business.

SOUTH AUSTRALIA

John Campbell writes again this month and lets us into all the secrets from over there. There were no VK3s at the recent Convention Group meeting, but a new issue of VK3 SWL Cards were received. Len Cragan has obviously been very busy listening as he has heard the following VK areas: VK2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

I have also heard that a ZSSC was social with the VK3s and that they were very interested in finding out all about it. That, however, is all the news for this month. I have also heard that some of the VK3s are showing an interest in these notes during 1956 and appreciate that your efforts are very much appreciated. Good wishes to all for 1956. New Year and we hope you have success in your various activities.

XYL CORNER

BY PHYL MONCUR

Our XYL for this month is Muriel Sinbeck (Mrs. SYAN) who is the mother of two small male type harmonics. Muriel has one of those bubbly-over sort of personalities with loads of enthusiasm for everything she enters into. As well as looking after her "Ham" and his two little "pork chops" she manages to combine a spare time occupation of giving driving lessons for those desirous of gaining another sort of ticket. Here is her contribution to our column.

VOICKS, YALLYHO AND SPARE THE HORSEPOWER

Upon hearing loud bangs and much activity coming from the direction of our family "Bomb" one sunny Sunday morning, I thought, ah! looks like a nice run to the country this morning. But, horror of horrors, on investigating, what met my eye but the glove box out upon the ground and the engine in innards of the car strewn higher and thither.

"What goes on?" I managed to get out when I had finally collected my wits. To which my OM said, with that bright mysterious gleam in his eye we XYLS have learned to dread, "Just wait till you see this, we'll clean 'em all up next time." "Clean up this?" I stammered. "What on earth are you doing?" "Well," he says, "the speaker goes here, the receiver will go there and the power supply will go in the boot, you see, pretty nifty, isn't it?"

Well frankly I didn't see and to cap it all off it seemed there was to be a contraption, looking like a smaller version of my rotary telephone, with some ingenious method of rotating same. This being called the "beam."

"Go on, go on," I stormed, "as if it isn't bad enough having to put up with all that Yakkity Yak! here, without taking it with us too." Well, when my OM had finally calmed me down, explanations were carried out. I was given to understand that we were to be in the next "Fox Hunt," though for the life of me I could not see why we had to do with foxes. I told my OM as much, whereupon I was addressed with his favourite term of "Listen Log, it's not a real fox at all, but one of the boys in another car, and we have to catch him and catch him." "Well," I muttered, "what a way to spend an evening. Chasing some silly clot my dad says he had to do with foxes to do that. If you ask me, you're all mad."

Of course the work proceeded and at last the big night arrived. We were all set to go. With our surprise, the boys were submitted to the back seat for our two harmonics, my OM frantically making last minute adjustments to the receiver and myself to the wheel. I seemed off to the starting point. Imagine my surprise when on arrival there I was introduced to other XYLS and YLs who I understood were to be Navigators. I was told that they were very keen about it all. I preferred to reserve judgment until later in the night.

Eight o'clock came and away went the "Fox" (SYN) and his XYL Phil doing a grand job as scorer. After about ten minutes or so the "Hounds" (that's us) were let loose and off we went. I was told that they were very keen about it all. I preferred to reserve judgment until later in the night.



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VICTORIA

The December general meeting was family night and the best attended general meeting for the whole year. President Gordon 3TP arranged with Father Xmas to come along with a gift for all the kiddies and we were shown some very excellent films. Two documentaries, kindly arranged by Roth 3BG, in conjunction with the Commonwealth Oil Co. showed two very amusing comedies for the children.

Visitors included Senator Manuel Willis (XELX), of the Mexican Delegation; WOPBR and Bob YALIAA, Senator Willis, XELXJ, made a presentation to the Victorian Division of a pennant from the Radio League of Mexico, and the President, Gordon 3TP, then presented XELXJ with a badge of the Wireless Institute of Australia as a memento of his visit to VK3. Ron Higginbotham, 3RN, was presented with the Gadagad Trophy for his long years of service and untiring efforts in connection with the publication of "Amateur Radio". A very great honour, but most richly deserved.

The following new members were welcomed to the Institute: Fully members—Messrs. R. A. Smith, 3QP, E. R. Kelly, 3ZAK; J. Sepir, 3ZEE. Associates—Messrs. C. E. Schneider, D. G. Baulch, D. J. Dunlop, Junior Associates—Messrs. R. A. Ezpie, D. N. Holmes, R. G. Tacey. At the conclusion of a very jolly evening, supper was served and we must congratulate our President's XYL, Nina, who did the majority of the cooking, also Marg (Mrs. 3ALV) and our Administrative Secretary (Mrs. May) who both lent her a hand.

There will be no general meeting in January, the next general meeting will be held on February 6, 1957. The Victorian Division office in Queen Street will be closed for three weeks from 15th January to 10th February while the Administrative Secretary, Mrs. May, takes her annual holidays.

Owing to the Olympics, the Bi-Monthly All-Band Scramble was not held in December, but the next Scramble will be held on Monday, 4th February, 1957.

We had an interstate visitor of note here in VK3 recently in Jim Corbett, 2VC, President of the VK3 Division. Jim was over here for the Civil Defence Emergency School held at Macedon and many VK3s had great pleasure in meeting Jim.

Our Technical Editor, Ken 3AFJ, hasn't been at all well lately, he's got a nasty pain in his tummy, but manages to carry on with his job cheerfully. We all hope your trouble clears up soon Ken.

THE OLYMPIC DINNER

The Annual W.I.A. Dinner which, this year, was known as the Olympic Dinner, was an outstanding success. There were 80 present and the guests included Senator Hannan, who supported the toast to the Wireless Institute of Australia and made an interesting statement in regard to the remission of sales tax on equipment used by Amateurs. Other guests included representatives of the Postmaster General's Department in Messrs. Pearson, Punch and Dobbin, and also Mr. McDonald of the Australian Broadcasting Control Board. International and Interstate Amateurs here in Melbourne for the Olympic Games included Armas OH2NB, Chester WOPBR, Les ZM6AS, Hilton ZLZMN, Jim ZLADR, Bill VK3XT and VK4GA. Chester WOPBR had with him his pocket sized personal broadcast portable receiver which interested everyone. Its dimensions were 4" x 6" x 1½" completely transistorised and gives 600 hours life from two tiny batteries 1½" long.

There were also representatives of the Advertising Trade and Mr. Bert Pringle, of A.W.A., responded on their behalf and complimented the Wireless Institute on the fine work it has done over the years. Among the VK3s we were pleased to see some of our country members and several of our real old timers.

The Dinner was held at the Prince of Wales Hotel, St. Kilda, and was very capably organised by Doug 3DU. The organising of the seating arrangement was particularly good; in this Doug was assisted by his XYL Audrey who made out the place cards which had the Amateurs' names and call signs and the guests' names printed on them and these they pinned to their lapel and served as an introduction to one another. Audrey also made out a very handy directory card showing the seating arrangement which was placed at the entrance to the dining hall and helped considerably in getting everyone seated quite quickly.

Congratulations and thanks are extended to Doug 3DU for the success of this important event.

80 METRE TRANSMITTER HUNT

It was a lovely fine, pleasant, sunny Sunday afternoon and our VK3 Amateurs and their families turned up in full force to greet our Olympic visitors. There were 120 attended the hunt and among the Olympic visitors were Bob YALIAA from Afghanistan, Peta ZL2ABJ and

Geoff ZL2SK from New Zealand, Evan VK4EF from Queensland, Gil VK7-SWL from Tasmania and several of our VK3 country Amateurs.

Len 3LN hid the tx and it was located at Deep Rock Swimming Pool in the Nuttall Park at Studley Park. The aerial he used was five circles extending over a quarter mile area, feed line was a co-ax feed line which was taken from an over-hanging tree through the water and underground to a position 30 ft. from the river where the tx, batteries and keying motor were buried under ground.

The first one to locate the tx, the winner, was Jack 3VZ, who arriving in haste at the location and hot on the scent, jumped out of his car armed with grid dipper, then turned back with the remark, "better turn the gear off," and then proceeded to track down the tx. A quarter of an hour later someone called out, "Jack, you've lost the signal of your car running." Well, he did remember to turn the most important thing (the rx) off, anyway. Reg 3ZAD was second and Eric 3ADU was third.

In true Olympic style they stood on a dias with their heads through Olympic circles and were presented with tx hunt type, gold, silver and bronze medals cut out of plywood and suitably painted and endorsed by 3LN. The

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presentation was made by one of our guests of honour, Bob YALIA, with Mrs. 3LN doing the boy scout act, complete with scout hat and scarf and carrying the medals on a cushion.

The outing was a grand get-together and finished with a picnic tea on a grassy bank in a very picturesque part of our Yarra River.

The next tx time will be held during February, when the date is arranged it will be advertised in our next monthly broadcast.

Jack 3VZ, the winner, will be hiding the tx.

SOUTH WESTERN ZONE

The zone hasn't been very active since the last Convention held in Ballarat. Still only the same old few holding things together, so come on chaps and rally yourselves now that Xmas is over as it is very hard to hear that we have retained the Kinnear Trophy for another year.

From the zone we thank all who attended the State Convention to represent our zone. The zone hook-up has been badly affected on 7 Mc. at 10 o'clock each Sunday since the Convention. 3XI and 3JA come on and there isn't anyone else, so how about cranking up those tx's chaps! Bertie 3VA seems to be bashing Inigo Case's (3ACE) ears, of Birchlip; never mind Clyde, Bert has also had a visit from John 3K and Keith 3VJ, but only to talk all about hi fi.

John 3ARJ is still getting a few minutes for radio. Harry 3XJ is not very active at present as he is constructing a caravan so it looks as though he might finish up with a GCR rig built in same. Wal 3UT, from the Coast country, isn't very active at present either. Norm 3EQ is busy building a beam for tv. which will be taking him from one type of screen to another. Jack 3JA hasn't been very active owing to illness in the family.

If anyone has any photos of the last Convention held at Ballarat and could spare some, please send same to Bill Wines, 43 Crawley St, Warrnambool, until chaps as it is now 1957. I wish all zone members a happy and prosperous New Year and may all that you wish for, come your way.

NORTH EASTERN ZONE

As my spies have all developed glass wrists and have gone to the Olympic Games, there is no zone activity to write about. On behalf of the zone, I would like to wish everyone the cheers of the season and best of DX for 1957.

CENTRAL WESTERN ZONE

By the time these notes are being read Chas 3IB will be on his way down to the cold regions of the South Pole again. He has been appointed Radio Constructor of the new base to be established on Vestfold Hills, this location is approx. 400 miles east of the already well known Mawson Base. We all wish Chas a happy trip and stay on this new venture, guess that it will not be long, after they get settled, when we will hear Chas on the air relating to us the happenings and experiences on this new Base.

Recently a Hobbies Exhibition was held in Stavell and Keith 3AKP went to quite a lot of trouble in installing an Amateur Station at this "do". It was an outstanding success and we must thank Keith for all the work he put into this. Jim 3VJ, Allan 3BL and your scribe helped out with some operating. Also thanks to the stations we worked during operations; there seemed to be someone there to help us out all the time.

GEELONG AMATEUR RADIO CLUB

At a recent meeting, Bill 3BU entertained members at his new QTH and gave them present a fine demonstration of tv. application and

noise and tx interference. Various types of antennae were used and a low powered tx alongside showed what type of tx. could be expected. Later the same evening many films of Conventions and events around Geelong were shown on 8 and 16 mm. film. To conclude a most interesting evening Mr. Brownhill regaled those present with a fine repeat.

The warmer weather is bringing out the mobile and d.f. equipment. Tx hunts on 80 mc are the rage here and Ted 3ARJ hid the tx near Ocean Grove. His location was well camouflaged—however the place getters were as follows: 1st, Kevin 3ZL, 2nd, Vic Clark, 3rd, R. Heighway. Other hunts were held during the afternoon with excellent results.

Bob 3IC had us down to his shack and we were royally welcomed and treated. The contents of Bob's shack were eagerly studied; the band was rather noisy for contacts but we saw the 3C49 and 3C49A. Bob's sister saw to our inner wants and was yarned for so long that the night slipped away. Many thanks to Bob and his sister for their hospitality.

The usual Xmas Party was held in the Club rooms where we renewed friendship with old acquaintances. We all send our best wishes for the New Year.

FIFTY-SIX MEGACYCLES AND ABOVE

(Continued from Page 13)

NEW SOUTH WALES

Popularity of 2 mx is greatly enhanced by the growing activity of more and more Hams and newcomers heard around the zone every evening now. The monthly meetings of the Group are always well attended and all members are very keen and willing to assist one another in every way. The Committee has in mind to instruct on such matters as Constructional Practices for V.h.f., Grid Dip Oscillators, Beam Antennae, i.f. Channels, Transmitters, Beam Feeders, and the like, and it is felt that members of the Group will all enjoy as well a benefit from the instructions which are due to commence in the near future.

The regular monthly Fox Hunt-Hidden Tx Hunt was held on 5th Dec. from 2005 hrs. to 2135 hrs. when Dave 2AWZ operated his portable/mobile gear hidden at Sugar Loaf Point. About eight or nine cars took part and assembled at Ryde and then took off in various directions for the hunt. Scores were: 1st 2ANP, 50 minutes; 2nd, 2ZCF, 70 min.; 3rd, 2AFM, 85 min. Others were directed to the spot by Dave.

From the Northern Area we have heard that Roy 2HO has been putting in a good test signal and has been worked by 2VU and 2ANU. Bob 2ARH has been worked by 2VU and heard by 2ANU. On Nov. 17 tests were carried out between Tamworth and Sydney, 2APG/P operating on 2 mx from 24TD's QTH was heard by 2HO, 2HL, 2AG, also 2VU and 2ANU at good strength, c.w. and phone being used. Les 2ZCB, of Scone, called on 2ANU to see what makes things tick, and now the path between Muscle Creek and Scone is 59 both ways, using 3 over 3 beam and quarter wave vertical on vehicle. Both 2ANU and 2VU came 3rd in Tx Hunt at Woy Woy—road blocked, so had to take off on foot, hi!

Activity on the move in Tamworth and should greatly expand with the formation of the Radio and Electronics Club, which is believed has a membership of twenty and still growing. Tx. tests have taken up most of 2VU's time of late—mainly in the test of the 16 element phased array runs rings around all others. 2ZBK, in Blayney, has been heard in Sydney at 89.

I wish you all a very happy New Year with plenty of DX on 2 mx.—2AFM.

OBITUARY

BILL YOUNG, VK4YA

During November, Bill Young, VK4YA, passed away and with his passing the Queensland Division lost an untiring worker for the W.A. Bill held the job of Secretary of that Division through the period when activity was almost at a standstill and had it not been for the hard work of Bill and the other chaps on Council the W.A. Queensland Division might have folded up.

In 1955 Bill found his health failing, but kept on with the job to the best of his ability. On medical advice he had to give up the job and, shortly after, he suffered a serious stroke which almost took him from us then.

He had a partial recovery but was completely invalided and went to Ipswich to live with his brother. As his health improved, he fired up his rig again and though we could not hear him here in Brisbane on 20 metres unless skip was very short, we could hear the DX replying to his calls.

Ham Radio did wonders for him in the last months of his life as an occupational therapy. Bill had been a Ham for thirty years and the ranks of Amateurs have lost an ardent follower.

W.I.A. members and "Amateur Radio" extend to his relatives their deepest sympathy.

QUEENSLAND

BRISBANE AND DISTRICT

At the end of November the Junior Chamber of Commerce held a Hobbies Show at the City Hall and the W.I.A. was asked to take part in with a working Ham Station. A working "bee" got an exhibit into shape and things went off wonderfully with a good attendance of both Hams and the general public. The Exhibition was part of the "Junior Chambers" drive against juvenile delinquency by trying to interest the younger generation in a hobby of some sort, though one bright character said the Ham Radio exhibit was an excellent way to encourage youths to become delinquents, after all "you don't have to be mad to be a Ham but it helps" Peter Evans, the President of the Junior Chamber, agreed to have a special QSL card printed for VK4WJ for the stations which contacted the exhibition station. The show gave the public a wonderful idea of how Amateur Radio worked and with a two metre link between the City Hall and 4TN's shack we were able to use both tx and rx for plenty of DX contacts.

A welcome visitor to Brisbane during November and December was Arthur 4FE, that "beechomber" from beautiful Thursday Island. Arthur took his turn on the roster of operators at the Hobbies Show and attended the Christmas "Get-together" at Anzac House. Arthur is trying very hard to have Thursday Island back on a separate contract for DX. C. Listens so that he can have an open slather with DX. Why, he even tried to have Magnetic Island, near Townsville, declared a separate area, so that the "DX-pedition" over there each Sunday when he was in residence at Townsville. We're afraid his spell on Thursday Island spoiled him and made him discontented.

A Happy New Year

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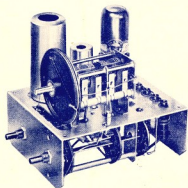
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